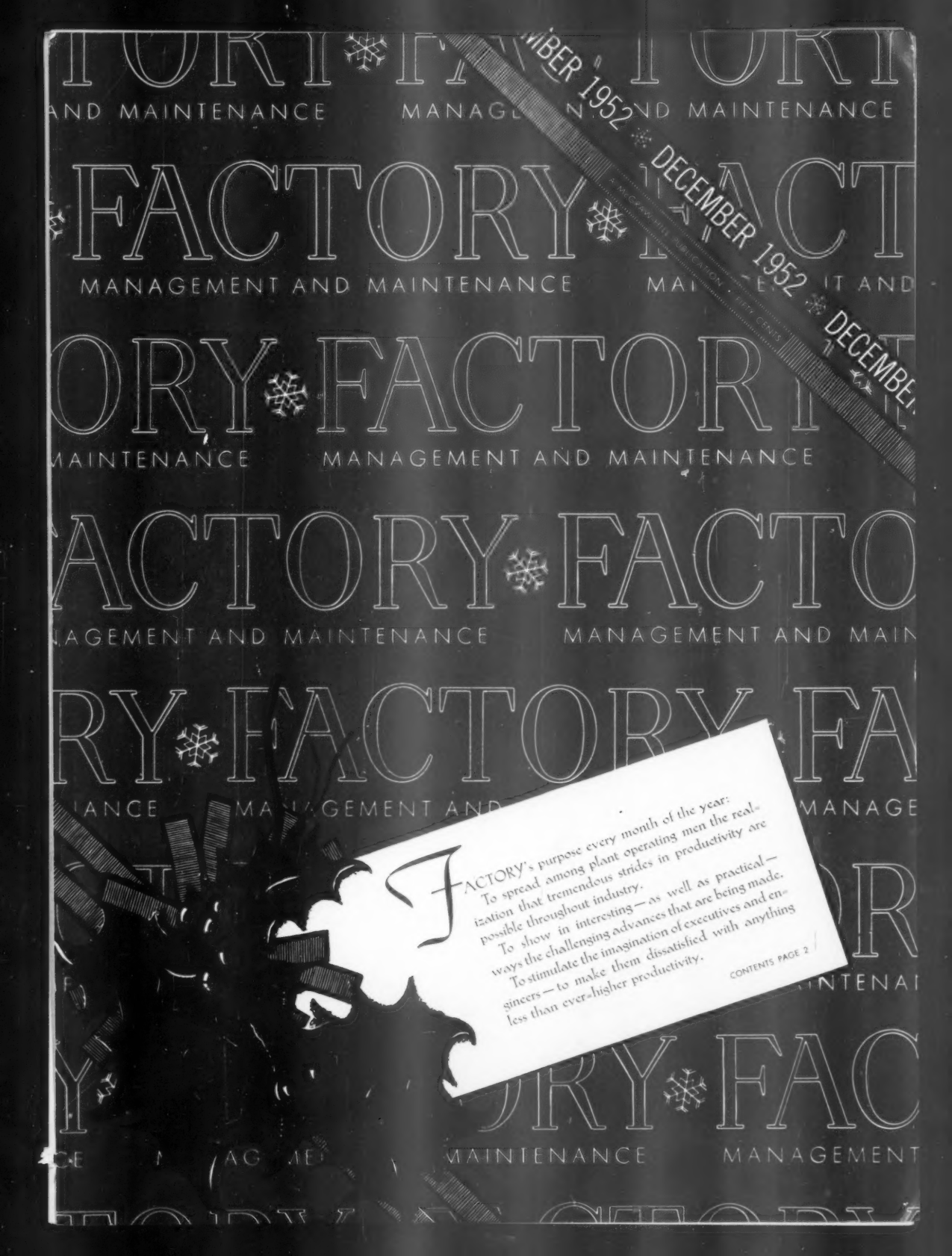
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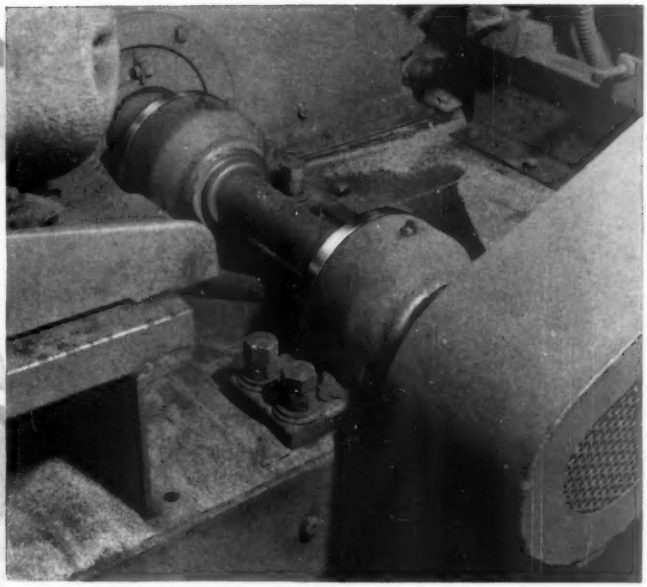
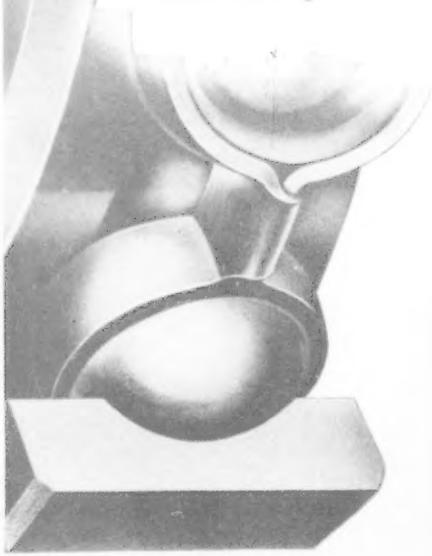


# "On the ball" insurance against friction sabotage



You can actually see the greatest threat to continuous operation of a grit-blasting machine in the above illustration. Those fine particles in the foreground are #50 steel grit. The air surrounding the machine is always contaminated with them. But they represent only one of the threats . . . heavy shaft loads, high speed and heavy vibration are the others.

Ordinarily, the drive shaft bearings would be most vulnerable to these conditions. But the two Fafnir SAODD type 2½" Ball Bearing Pillow Blocks shown are specifically designed to withstand them. For example, Fafnir-originated dust shields are practically impervious to dirt . . . thus keep the bearings clean. Notice how they have been polished to a high finish. The bearings shown have been operating for nearly three years . . . on a two 40-hour shift basis. Like all Fafnir Industrial Units, these SAODD Pillow Blocks have the famous Fafnir Wide Inner Ring Ball Bearings with self-locking collars . . . easiest of all to install.

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EACH time this machine is started the belts that drive it take a beating. The shock, combined with the heavy pulling load and high speed, caused the first set of V belts used on this drive to fail in only 6 months. Something exceptional was needed, so B. F. Goodrich grommet V belts were installed. That was over 4 years ago, and they're still in use. In fact, the company superintendent says it looks as though this same set of grommet V belts will operate another 10 years. Here's why B. F. Goodrich grommet belts outperform ordinary belts:

*No cord ends* — A grommet is endless, made by winding heavy cord on itself to form an endless loop. It has no overlapping ends. Because most of the failures in ordinary V belts occur in the region where cords overlap, the endless cord section in a grommet V belt eliminates such failures.

*Concentrated cord strength* — All of the cord material in a B. F. Goodrich grommet belt is *concentrated* in twin grommets, positioned close to the driving faces of the pulley. There are no layers of cords to rub against one another and generate heat; cord and adhesion failures are reduced. And grommet V belts stretch less — only ⅓ as much, on an average, as ordinary V belts.

*Better grip, less slip* — Grommet V belts have more rubber in relation to belt size. Without any stiff overlap, they're more flexible, grip pulleys better. Size for size, grommet belts give ⅓ more gripping power, pull heavier loads with a higher safety factor. Because there is less slip, there is also less surface wear.

*They cost no more* — Grommet V belts cut costs because they last longer, increase production because machines keep running with fewer interruptions, reduce maintenance costs because they need less attention, yet they cost not one cent more. Available in C, D, and E sections. But remember, only B. F. Goodrich makes the grommet V belt (U. S. Patent No. 2,233,294), so to get all these savings, call in your local BFG distributor the next time you need V belts, or write *The B.F.Goodrich Company, Industrial & General Products Division, Akron, Ohio.* (Available in Canada)

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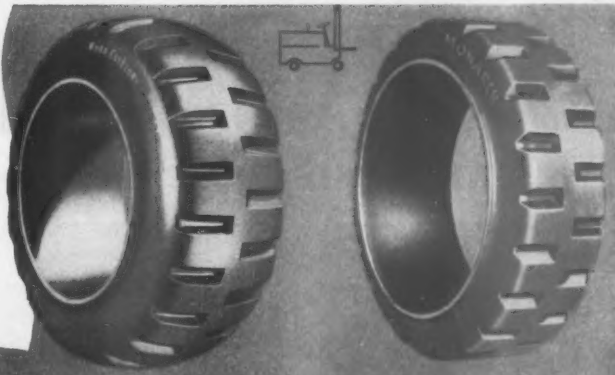

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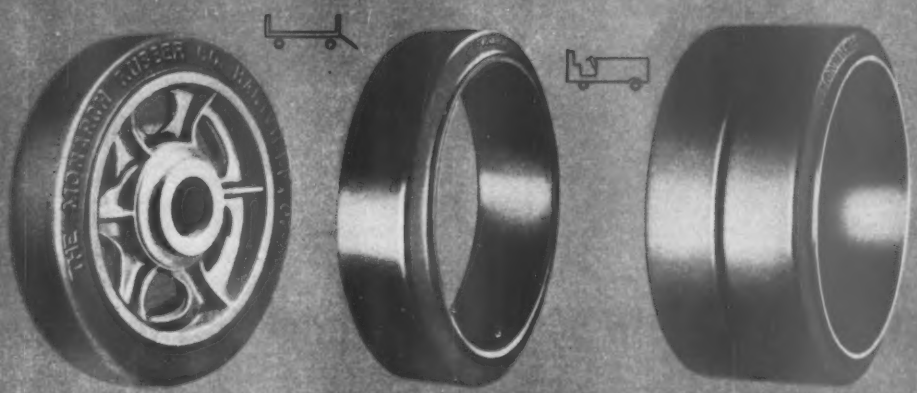

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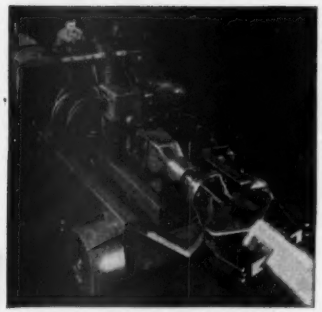

*Unusual equipment? Cumbersome loads?*

*Need tires to resist cuts and snags?*

*Tire-damaging hauling surfaces?*

*Which tread compound for greasy floors?*

*Giant loads to store?*

*Which tread design gives longest wear?*

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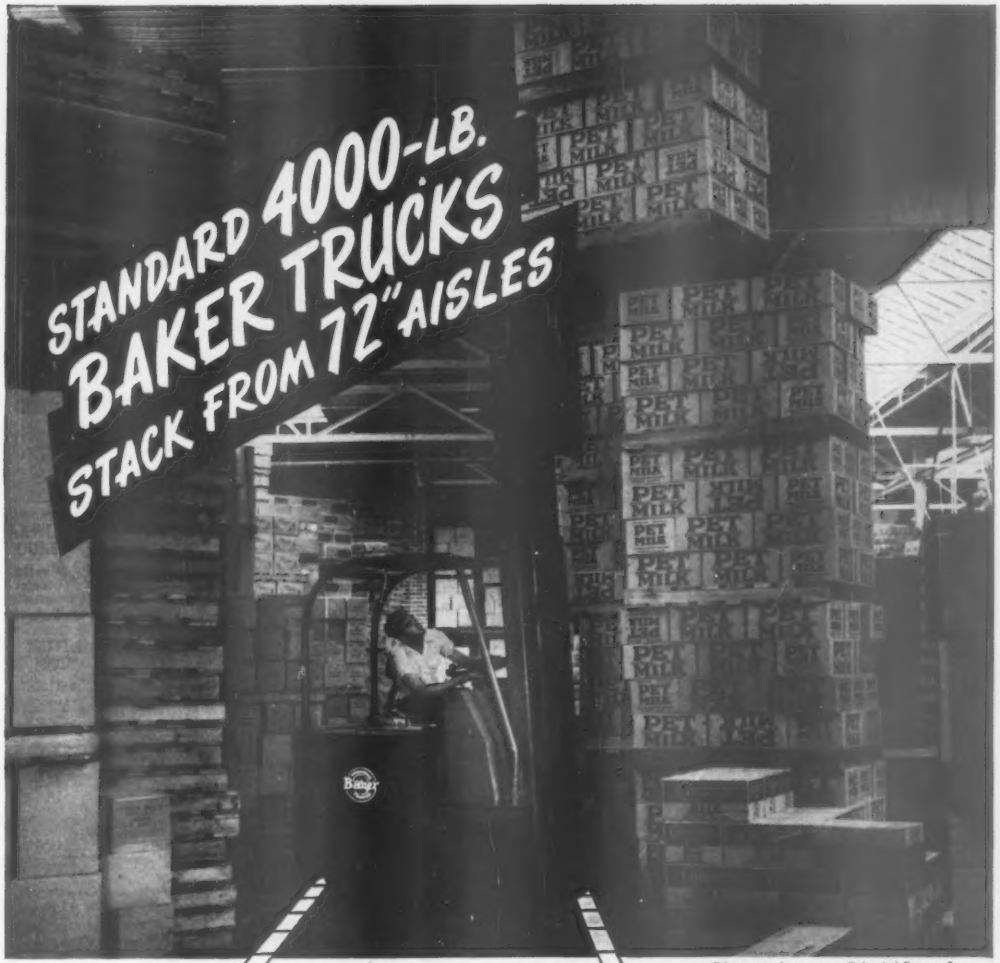


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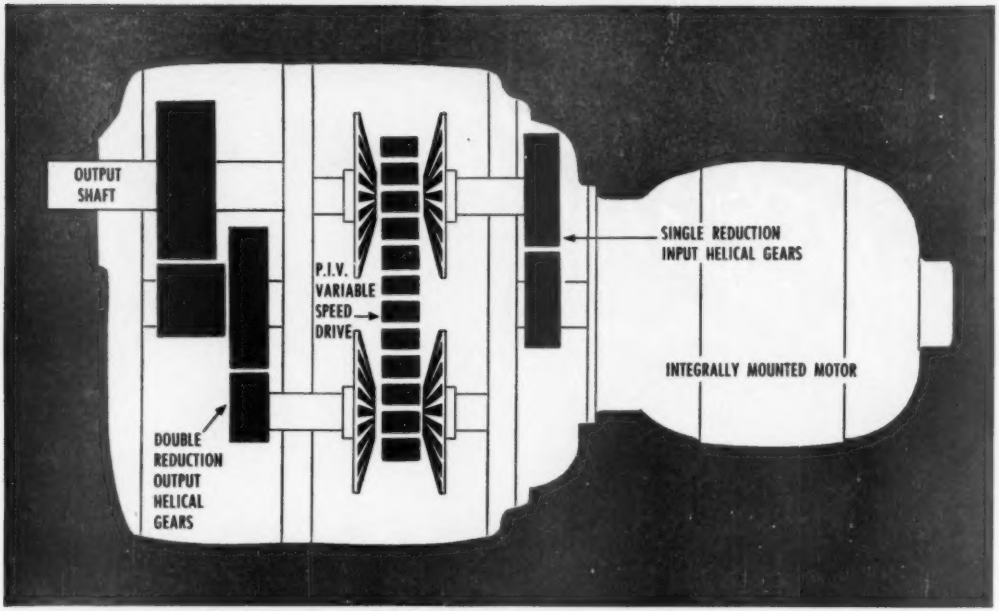


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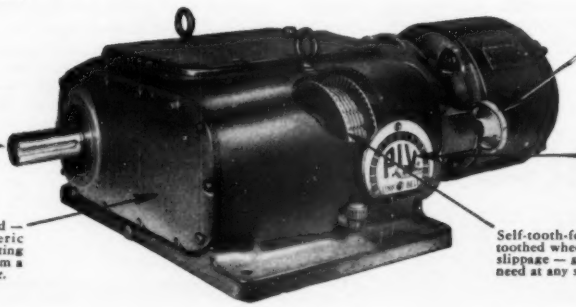

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Of course, Allis-Chalmers Certified Service Shops give good service on any electrical equipment, of any make. Tear out this ad and save it, or write the name of the A-C Certified Service Shop nearest you in your address book. Allis-Chalmers, Milwaukee 1, Wisconsin. A-3864

*Texrope* and *Vari-Pitch* are Allis-Chalmers trademarks.

**ALLIS-CHALMERS**

**Sold . . .**
**Applied . . .**
**Serviced . . .**

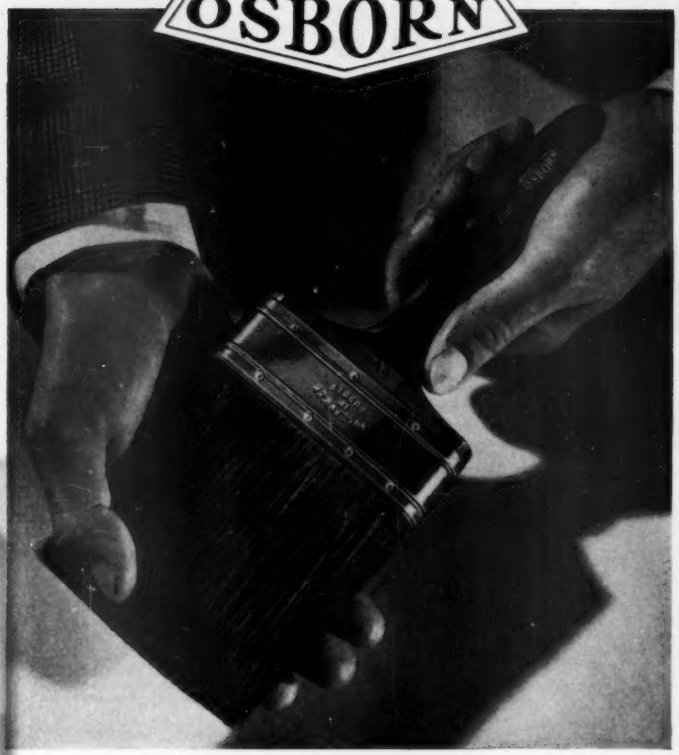
by Allis-Chalmers Authorized Distributors, Certified Service Shops and Sales Offices throughout the country.

**CONTROL** — Manual, magnetic and combination starters; push button stations and components for complete control systems.

***TEXROPE*** — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

**PUMPS** — Integra. types from ¾ in. to 72 in. discharge and up.

OSBORN

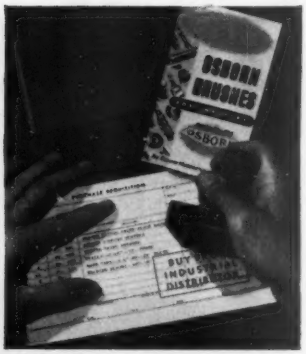


# Why shop around? Just specify "OSBORN"

*YOU KNOW* OSBORN Brushes are good. To simplify buying and to assure getting unsurpassed quality, all you need to do is *specify* "OSBORN". No need for shopping around. No chance for questionable quality. You can buy OSBORN paint, maintenance and power brushes with confidence because their workmanship and materials are backed by 60 years of OSBORN service to Industry. Order them automatically from your INDUSTRIAL DISTRIBUTOR on the same order as other mill supplies. *The Osborn Manufacturing Company, Dept. 890, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Osborn Brushes

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES




**IT'S SIMPLE.** You can make one order cover OSBORN brushes and other leading-brand mill supplies when you buy from your Industrial Distributor. This standard practice streamlines your purchasing, cuts your supplies inventory, assures you good service on top quality products.

**HANDY STOCK.** Your Industrial Distributor carries a large stock of OSBORN brushes to supply you with the right type of brush promptly. Saves your time. The OSBORN Master* Sweep Floor Brush shown is a nationally recognized product.

**FOR *YOUR* NEEDS.** There is a complete line of Osborn power brushes to meet your cleaning and finishing problems. Built for Industry by the Company that knows Industry's problems. They do their jobs thoroughly and fast. *Trade-mark.

# It "Takes the Pick" of Your Clothes

Added Evidence that—

## Everyone Can Count on VEEDER-ROOT

Weavers know this as a Pick Counter, because it counts the picks, or trips of the shuttle across the loom as cloth is woven. And this is the newly modernized model of the original V-R 2-3 Convertible Counter. 4th counting unit is also available.

This is another V-R "first" in advancement of counter design for every field of industry. And it's more than likely that V-R can supply or design a counter that will count to *your* advantage. Find out. Write:

**VEEDER-ROOT INCORPORATED**

"The Name That Counts"

**HARTFORD 2, CONNECTICUT**

Chicago 6, Ill. • New York 19, N. Y. • Greenville, S. C.
Montreal 2, Canada • Dundee, Scotland
Offices and Agents in Principal Cities

# 32 YEARS YOUNG!

Way back in 1920, this Elwell-Parker truck began operating in a prominent Canadian foundry. It had to transport racks of cores directly into core ovens where heat reached 400°. Even under such gruelling usage, the truck is still *serving daily!* Time and manpower saved have repayed truck's cost over and over.

*This same* BUILT-IN DEPENDABILITY *is available to you in the modern Elwell-Parker.*

***Handling Cores...*"Like Handling Fresh Cookies."**

That's how this foundry describes fragile, unbaked cores that can't stand jarring in transit. But breakage is kept to a minimum by the electric truck's easy starts, smooth acceleration and gentle stops—all features of Elwell-Parker truck performance.

E-P trucks for foundries have specially designed lift and travel acceleration to protect cores. Yet fast operation saves heat when exchanging green and baked cores. Vital parts are dust-proofed.

For *more* years of reliable service, make your next truck the finest by ordering from The Elwell-Parker Electric Co., 4031 St. Clair Ave., Cleveland 3, Ohio.

***NEW General Catalog***
**describes all E-P trucks in detail. Write for your copy *NOW*.**

## NEWER ELWELL-PARKERS IN THIS FOUNDRY

Now this firm has a *fleet* of E-P trucks because they have paid off with two major benefits: (1) In spite of increased volume, faster handling by trucks has considerably offset need for costly plant expansion; (2) Mechanized handling has freed many men for more productive work.

**ELWELL-PARKER**
**POWER INDUSTRIAL TRUCKS**
*Established 1893*

Invaluable in maintenance work, this truck here transports and lowers into place a 2600 lb. steam kettle.

# Continuous Handling Without Down Time

**Absolute Dependability, Lower Maintenance Cost, and Greater Safety explain why Manufacturing Chemist says: "If I were getting another truck, I'd get one just like this. . . . It fits our needs perfectly!"**

**MAIN JOBS DONE**

This Elwell-Parker fork truck carries drums or buckets of chemicals in palletized loads. It transports them within the plant, stacks triple high for storage, and finally loads them into highway trucks.

**BUT THAT'S NOT ALL**

This versatile truck aids on many maintenance jobs, such as (1) installing steam kettles, (2) installing heavy pipes near the ceilings, (3) changing overhead lights, etc.

**SAFE, TOO**

Being electric powered, this Elwell-Parker is fume-free. (Exhaust from a previously used gasoline truck made men ill.) Plant manager praises the truck's safety features—particularly, standing position that keeps operator alert, and "dead-man control" that stops truck the instant driver steps off pedals.

**LESS MAINTENANCE, COMPLETE RELIABILITY**

This Elwell-Parker has not required costly repairs like its predecessor, which often broke down when critically needed because its gas engine required attention . . . In fact, its record to date shows continuous service for over a year without a single operating failure . . . Get more facts on the dependability of these trucks by writing The Elwell-Parker Electric Co., 4031 St. Clair Ave., Cleveland 3, Ohio.

500 lb. drums, four to a pallet, are triple stacked, to use profitably *all* overhead space.

By placing palletized drums directly in highway truck backed up to loading platform, labor is saved and shipments are expedited.

A Delta Carbide Tool Grinder *stationed at the tool keeps tool bits sharp—reduces "down-time", boosts output.*

# Put DELTA TOOL GRINDERS Beside Production Machines and Cut Down-Time

## How Edward Valves, Inc. does it—

**Delta Tool Grinders permanently located along side of automatic screw machines, engine lathes, boring mills and turret lathes, enable Edward Valves machine operators to keep tool points constantly sharp.**

Benefits: *less down-time, piece-rate operators have incentive to keep tools sharp, no time wasted between production machines and tool-sharpening room, smaller inventories of cutting tools, fewer tool replacements.*

Another Delta Grinder serves as a "utility man"—mounted on a skid, it is moved by lift truck from one machine to another or to other departments, wherever the pressure is on; plugs into the regular 110-volt lighting circuit; is used for deburring in addition to tool sharpening.

More Delta Tool Grinders are used in the tool sharpening room: and still others in the tool room for new tool production. This kind of production common-sense suggests that the same substantial savings may easily be yours for the taking. Why not survey your own tool-sharpening practices? A good first step is to contact your Delta dealer—he's a trained counselor on just such problems. Call him now.

*There's a Delta Power Tool for Your Job*— WOOD OR METAL WORKING ∽ 53 Machines ∽ 246 Models ∽ More than 1300 Accessories

DELTA MILWAUKEE

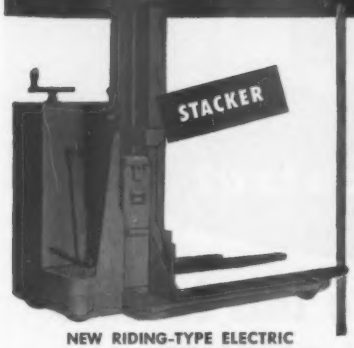
DELTA POWER TOOLS Another Rockwell Product

**Rockwell** DELTA POWER TOOL DIVISION MANUFACTURING COMPANY

628P NORTH LEXINGTON AVENUE • PITTSBURGH 8, PENNSYLVANIA

# NOW FOR ALL YOUR NARROW-AISLE... CLOSE-QUARTER OPERATIONS

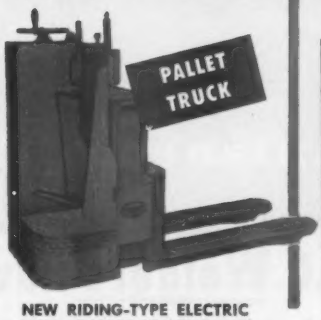
# AUTOMATIC'S NEW COMPLETE LINE OF Transveyor RIDING TYPE ELECTRIC TRUCKS




**NEW RIDING-TYPE ELECTRIC STACKER**

**2500 LBS. CAPACITY—48" LONG LOAD**
**4000 LBS. CAPACITY—48" LONG LOAD**

Lightweight, compact, maneuverable, rugged. Answers industry's need for a low-cost stacker for extreme close-quarter lifting, moving and stacking in 6 foot aisles . . . for operation on limited capacity floors and elevators.




**NEW RIDING-TYPE ELECTRIC PALLET TRUCK**

**4000 LBS. CAPACITY—48" LONG LOAD**

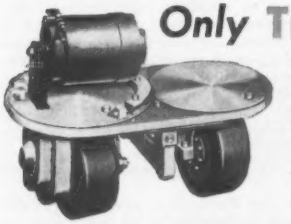
The Transveyor Pallet Truck with an overall length of only 29½" (less forks) makes possible right angle storing of 48" x 48" loads from aisles as narrow as 6½ feet. This means greater utilization of floor space plus quicker access to work areas.

**NEW RIDING-TYPE ELECTRIC PLATFORM TRUCK**

**4000 LBS. CAPACITY**

Short, compact and highly maneuverable, the Transveyor Platform Truck speeds operations in congested areas in plant or warehouse and on narrow, crowded shipping docks where both time and space are restricted.

## Only Transveyors have Balanced Action!



*Balanced Action* automatically equalizes the load on both wheels regardless of floor conditions. With conventional rigid axle mounting, uneven floors can cause improper load distribution, chassis distortion, and excessive wear.

But with Transveyor *Balanced Action,* uneven floor surfaces are compensated for by the exclusive center pivoted feature. This eliminates frame distortion and uneven load distribution.

Single steering wheel with uncontrolled action of caster follower may cause excessive tire damage and wear as well as unnecessary chassis vibration.

But with Transveyor exclusive *Balanced Action,* drive and idler wheels are connected by a tie rod and steer simultaneously. This greatly increases tire life by eliminating scrubbing action.

***MAIL COUPON TODAY***—for free colorful brochures containing diagrams, data, complete specifications on Automatic's New Transveyor line.

**Automatic®**

**WORLD'S LARGEST EXCLUSIVE BUILDER OF ELECTRIC INDUSTRIAL TRUCKS**

**Automatic®** **39 W. 87th Street, Dept. X-2 Chicago 20, Illinois**

Please send, without obligation, free literature on the new Automatic Transveyors.

*Company Name*.....

*By*.....*Position*.....

*Street Address*.....

*City*.....*Zone*.....*State*.....

# Only P&H AC Welders have this feature

## *for faster, easier, sounder welds on non-ferrous and "hard-to-weld" metals*

No other welder has this Instantaneous Control feature. Foot-operated, the control provides the heat you call for instantly, *electrically* — not mechanically. No time lag. It's a P&H exclusive that boosts production, cuts costs, saves time.

### Inert Gas Welding

Instantaneous control lets you handle "hard-to-weld" metals with ease — aluminum, magnesium, brass, copper, stainless, high carbon, high alloy, and low carbon steels. You get sound welds — X-ray quality every time. No burn-throughs, fewer rejections.

Operators like it, too. It gives them faster, better welds in only five simple steps. Check them:

1. Foot switch automatically turns on power, high frequency, water and gas.
2. Arch starts *instantly* without touching work.
3. Foot switch control provides exact heat needed *while* welding — *no time lag.*
4. Foot-operated control cuts power either gradually or instantly at completion of weld. Eliminates craters — no scrap pieces needed to run out bead.
5. Gas and water shut off automatically according to pre-set time delay.

Compare AC Inert Gas Welders, point by point, and you'll buy P&H. Check these outstanding features:

- **P&H Dial-lectric Control** — No moving coils or cores to bind or freeze. Maintenance is absolutely negligible.
- **Built-in high frequency unit** — eliminates additional external equipment. Variable frequency control.
- **Automatic gas and water control** — Pre-set automatic time delay control (2 seconds to 2 minutes) prevents electrode contamination, assures clean, sound welds.
- **Stepless amperage regulation** — from 10 amps to maximum. Three models available — ranges 200, 300 and 500 amps.
- **Unusual arc stability** — Makes good clean welds where extremely low amperages are required.
- **Selector switch** — gives operator instant choice of standard or high frequency unit.

No wonder P&H Inert Gas Welders are the choice of the aircraft industries where top quality work and speed are "musts". They join "hard-to-weld" metals faster and easier — eliminate rejects for you, too. Get full details from your P&H representative or write us for further information.

P&H

**WELDING DIVISION**
**HARNISCHFEGER CORPORATION**
4525 WEST NATIONAL AVE. • MILWAUKEE 14, WISCONSIN

2436

POWER SHOVELS • CRAWLER AND TRUCK CRANES • OVERHEAD CRANES • HOISTS • ARC WELDERS AND ELECTRODES • SOIL STABILIZERS • DIESEL ENGINES • PRE-FABRICATED HOMES

**Doehler-Jarvis Corporation, world's largest producer and finisher of die castings, utilizes energy in color in huge Toledo, Ohio, plant to improve working conditions.**

# Pittsburgh Color Dynamics

## Increases production efficiency . . . Lowers manufacturing costs . . . Reduces accident time loss

How Pittsburgh COLOR DYNAMICS helps management and workers alike is being demonstrated daily in a wide variety of industries.

● **This modern method** of putting the *energy in color* to work helps to increase production efficiency and lower manufacturing costs at the same time that it improves working conditions, simplifies housekeeping and reduces time-loss accidents.

● **An excellent example** of these results is the large Toledo, Ohio, plant of the Doehler-Jarvis Corporation.

● **This company** is the world's largest producer and finisher of die castings. Its experience in this field dates back to 1905, when H. H. Doehler invented the first metal die casting machine. Today the Doehler-Jarvis Corporation makes castings for motor cars and trucks, radio and television sets, household appliances, business machines and a great many other products.

● **The huge Toledo plant** was painted according to COLOR DYNAMICS several years ago. The benefits from this are best summarized by Robert H. Kitzman, vice-president in charge of manufacturing:

● **"As in most factories,** it had been our custom to paint our plant and equipment periodically to protect it from wear and deterioration. Then we decided to color-engineer our facilities the COLOR DYNAMICS way.

● **"By using *focal* colors** on working parts of machines, in contrast to *eye-rest* colors on stationary parts, we help our men to see their work better. By using eye-rest colors on walls, as well as colors with high light reflection on ceilings, we further reduce eye strain. This lessens physical fatigue.

● **"*Safety* colors** which mark hazard areas help to reduce danger of accidents. These improvements give us better workmanship, greater volume, higher morale and a better relationship between management and employees."

● **Why not test the practical value** of COLOR DYNAMICS in your plant. Use this modern painting system to put color to work on a machine or two—or in a complete department—and see the difference it makes.

### COLOR DYNAMICS Engineering Study of Your Plant — FREE!

● For a complete analysis of the service COLOR DYNAMICS can perform for you, send for our *free*, profusely illustrated booklet. It explains simply and clearly how to put color to work on machines, walls, floors, ceilings and mobile equipment. Better still, let us show you exactly how to apply it in your plant. We'll be glad to submit a color engineering study of your entire factory, or any part of it, without cost or obligation. Call your nearest Pittsburgh Plate Glass Company branch and arrange to have our COLOR DYNAMICS representative see you at your convenience. Or mail this coupon.

**SEND FOR A COPY OF THIS BOOK!**

Pittsburgh Plate Glass Co., Paint Div.
Dept. F-122, Pittsburgh 22, Pa.

☐ Please send me a FREE copy of your Booklet *"Color Dynamics."*

☐ Please have your representative call for a Color Dynamics Survey without obligation on our part.

Name _____

Street _____

City _____ County _____ State _____

Copr. 1952, Pittsburgh Plate Glass Co., Pittsburgh, Pa.

**PITTSBURGH PAINTS**

PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

# NEW INTRIMIK

## Internal Tri-point Micrometer

Measures any Size Bore or Hole
within range of tool...
***without masters***

Now you can realize new economies and speed by measuring bores and holes *directly!* The new Brown & Sharpe Intrimik Internal Tri-point Micrometer gives you a handy means of measuring in increments of .0001" on bore sizes from .275" to .500", and in increments of .0002" on bore sizes from .500" to 4.000". It's a big time and money saver... eliminates the need for expensive plugs and setting rings. Every feature for convenience, precision, and long service life is incorporated in its design and construction. Write for new illustrated Bulletin. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

Extensions are available for all size Intrimiks to facilitate measuring deep holes.

Furnished as individual tools and in sets

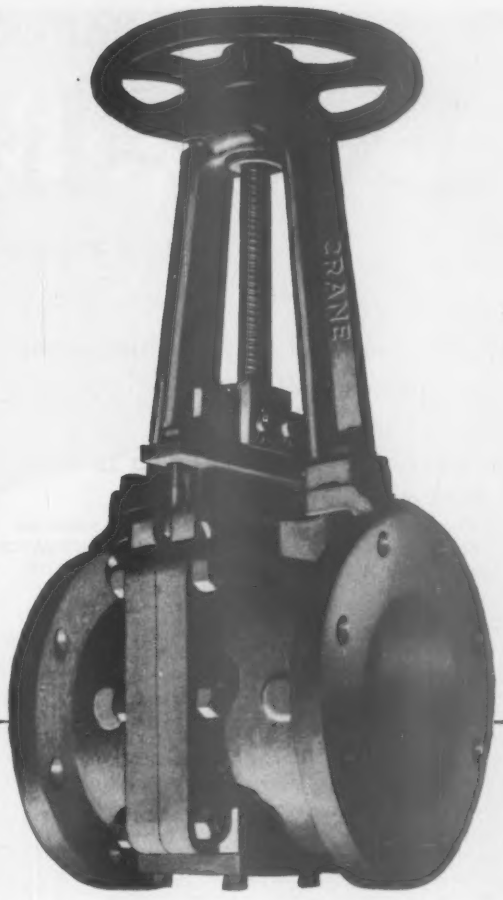
***WE URGE BUYING THROUGH THE DISTRIBUTOR***

# Brown & Sharpe

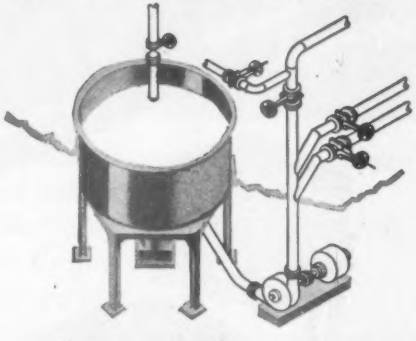
B·S

# This CRANE VALVE cut out costly shutdowns

In this case, a mill was having repeated trouble with special service valves. By replacing with a Crane design, the mill was freed of process interruptions as well as high valve servicing costs. You can always count on better performance like this with Crane Quality valves, and the complete Crane line meets every industry's needs.




***Read these Facts of the Case!***



***Where Installed:*** In a paper mill producing strong bag stock, on pulper outlet lines. Pulp here is of high consistency, normally about 6%. Continuous pulper operation is needed.

***Trouble Encountered:*** The pulp stock valves formerly used had a strong tendency toward clogging. This forced frequent shutdown of pulper for clean-out of valves and lines. It was costly in time, labor, and production loss.

***Solution and Result:*** The troublesome valves were replaced with Crane Pulp Stock Valves, now in service more than 5 years. Clogging was stopped completely. Since installed, Crane valves never have forced a single shutdown.

## *More* CRANE VALVES *are used than any other make*

CRANE CO., General Offices: 836 S. Michigan Ave., Chicago 5 • Branches and Wholesalers Serving All Industrial Areas

**VALVES • FITTINGS • PIPE • PLUMBING • HEATING**

# THE IMPROVED

# Exide-Ironclad

# BATTERY

## OUTSTANDING NEW FEATURES INCLUDING

the polyethylene insulating tube sealer combine to make Exide-Ironclad, *more than ever before*, YOUR BEST POWER BUY . . . AT ANY PRICE.

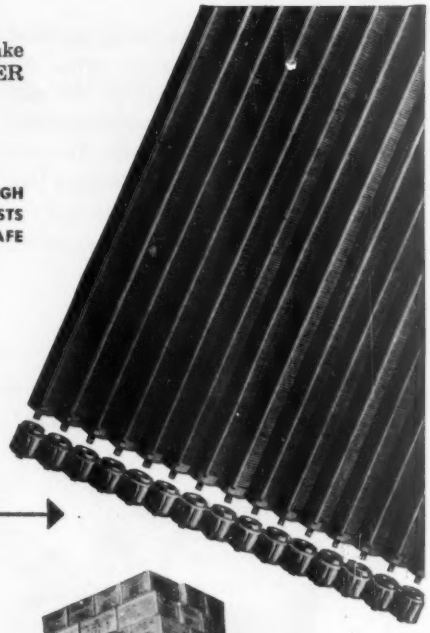
## THE IMPROVED EXIDE-IRONCLAD IS BUILT TO GIVE YOU . . .

**RAPID ACCURATE HANDLING . . . UNIFORM RATE OF HANDLING . . . HIGH AVAILABILITY . . . LOW OPERATING COSTS . . . LOW MAINTENANCE COSTS . . . LOW DEPRECIATION COSTS . . . HIGH MANEUVERABILITY . . . SAFE HANDLING.**

## BECAUSE OF . . .

**IMPROVED POSITIVE PLATE CONSTRUCTION.** The long-life grids now contain SILVIUM—an alloy of silver, lead and other components—which make them highly corrosion resistant.

**. . . the New Polyethylene insulating tube sealer of acid-proof, non-corroding plastic.** It fits snugly into slotted tubes of positive plate, and reduces loss of active material. Even the small sediment deposit of the past is reduced 50%. Thus more active material remains available, and the high battery capacity is maintained for a longer working life.



**IMPROVED NEGATIVE PLATES** for higher electrical efficiency.

**NEW SEALING COMPOUND**—provides permanent seal between jar and cover.

**SEAMLESS SHOCK-PROOF JAR,** of high quality rubber combines tensile strength and elongation for long-life and heavy-duty service.

**NEW UNBREAKABLE PLASTIC VENT PLUGS** of polyethylene.

**TYPES, SIZES AND CAPACITIES** for all kinds and makes of battery-electric trucks—hand and rider.

THE ELECTRIC STORAGE BATTERY CO.
Philadelphia 2
*Exide Batteries of Canada, Limited, Toronto*

***1888***
***DEPENDABLE BATTERIES FOR 64 YEARS***
***1952***

"EXIDE-IRONCLAD" and "SILVIUM" *Reg. T.M. U.S. Pat. Off.*

## *Whether you're color minded or cost conscious a Barreled Sunlight Paint Job is Engineered exactly to your needs*

*Color-minded* executives prefer Barreled Sunlight "Engineered Color" because it provides a *practical*, down-to-earth color plan that improves lighting and seeing conditions and is *custom tailored* to the special needs and conditions of each individual plant or building.

*Cost-conscious* executives know from experience that Barreled Sunlight Maintenance Paints are *specialized* finishes, especially built for rugged, heavy duty service. They know they go further, hide better and are easier to apply — which means not only worthwhile savings in material, but also important savings in labor, which today accounts for at least 80% of total painting costs.

Yes, whether you're color minded or cost conscious you can do the job better and at lower cost with famous Barreled Sunlight. The next time you paint call in your Barreled Sunlight representative. Let him recommend the colors and finishes which will give you a better looking, longer lasting paint job at lower cost for both material *and labor*.

***Write for this Helpful Booklet***

For full information on Barreled Sunlight Maintenance Finishes and Barreled Sunlight Engineered Color send today on your company letterhead for this fact-filled Barreled Sunlight Catalog. There's no charge—and no obligation.

**BARRELED SUNLIGHT PAINT COMPANY**
2-L Dudley St., Providence, R. I.

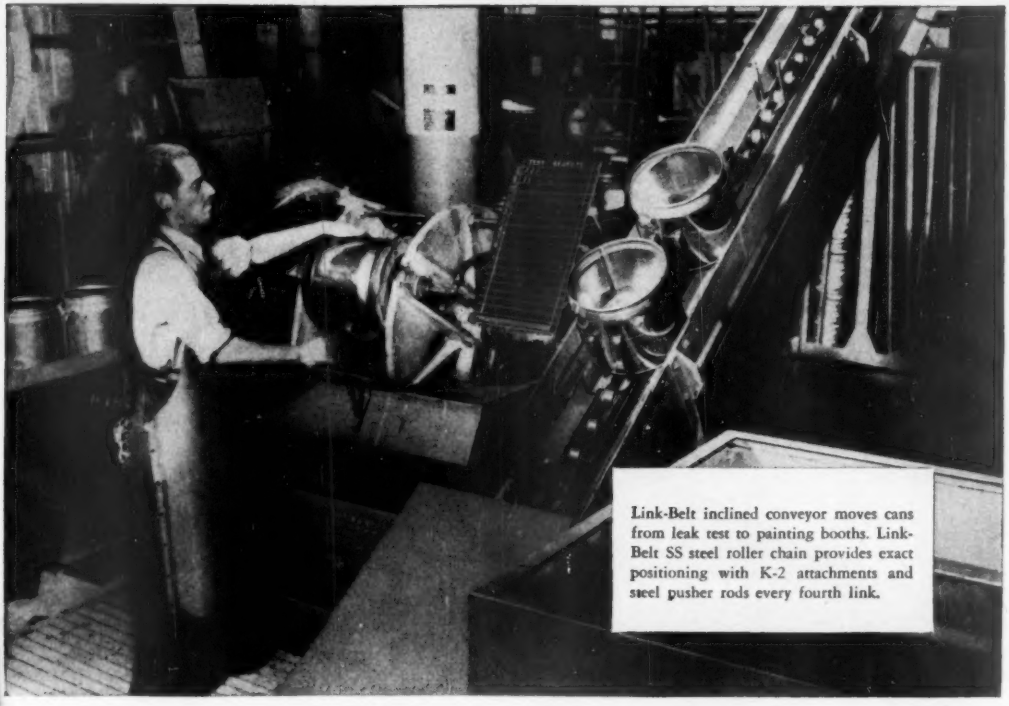
# Barreled Sunlight *Paints* ®

**In whitest white or clean, clear, wanted colors, there's a Barreled Sunlight Paint for every job**

**For over half a century those who know the best in paints . . . for all types of buildings . . . have strongly insisted on famous Barreled Sunlight**

*No ONE chain serves every purpose*

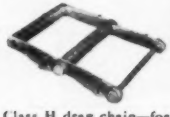
# LINK-BELT makes a Complete Chain Line



Link-Belt inclined conveyor moves cans from leak test to painting booths. Link-Belt SS steel roller chain provides exact positioning with K-2 attachments and steel pusher rods every fourth link.

## ...recommends the right one for your job

**Typical chains from the complete LINK-BELT line**



Class H drag chain—for drag conveyors, handling shavings or other refuse in runways or troughs.

Class C combination chain—popular, durable, low cost design for elevators, conveyors.

Class SS bushed roller chain with offset sidebars—for heavy drive service at moderate speeds.

Transfer chain with tilting dogs—for plate and slab travel, loads up to 300,000 pounds.

More than strength—more than uniformity—all operating qualities are taken into consideration by Link-Belt engineers when they recommend a chain for your job. From the most complete line of chains, they can select the *right type* to meet your specific requirements—large or small. And all are built to the highest standards. Accurate control of materials and manufacturing processes is your assurance of longer chain life.

**LINK-BELT COMPANY:** Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices, Factory Branch Stores and Distributors in principal cities. 12.775

**LINK-BELT**

***CHAINS AND SPROCKETS***

# THE AMERICAN STORY

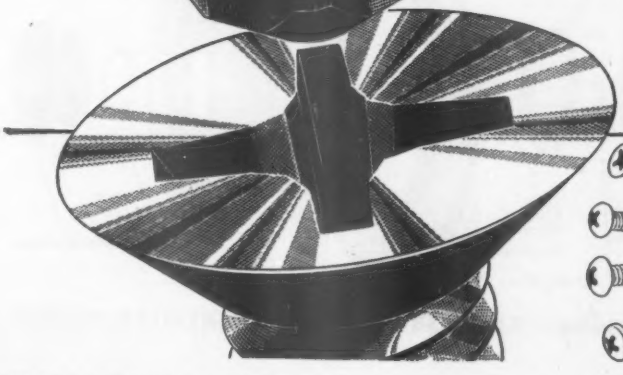
## CHAPTER 3:

## Self-Criticism

AMERICAN started out 114 years ago as the first screw manufacturer in this country. Since then, most of the major developments in threaded fastenings have been presented under the Eagle trademark . . . including the Phillips Recessed Head Screw.

But in all this time, American has stayed ahead in research and development because of one basic thing . . . *self-criticism*. And that means *constructive* self-criticism. For American was the first to establish an engineering laboratory to put the "Eagle-eye" on its own product as critically as on its competitors.

So when any product goes out under the Eagle trademark, it means that that product is as fine as can be made anywhere in the world today. *Try it and see.*



**AMERICAN SCREW COMPANY**

*PHILLIPS HEADquarters*

*WILLIMANTIC, CONNECTICUT*

Main Office & Plant
Willimantic, Conn.
Office & Plant, Norristown, Pa.
Office & Warehouse, Chicago, Ill.

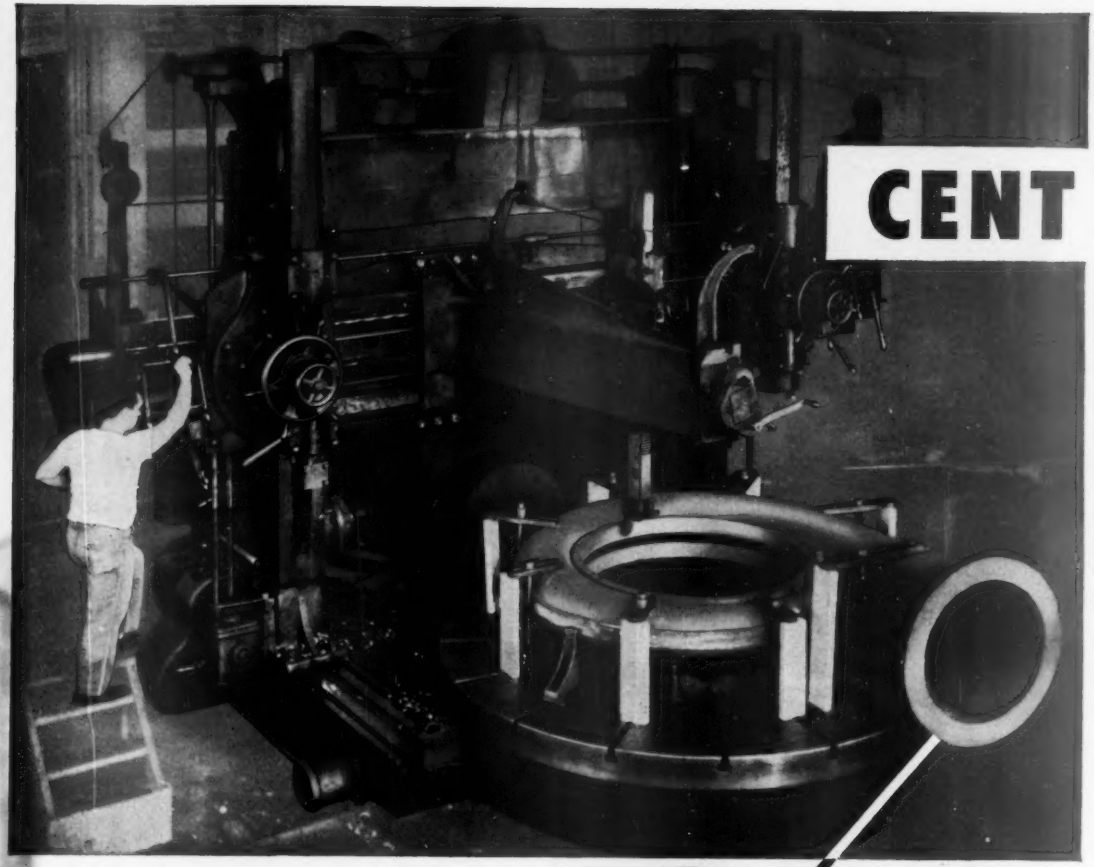
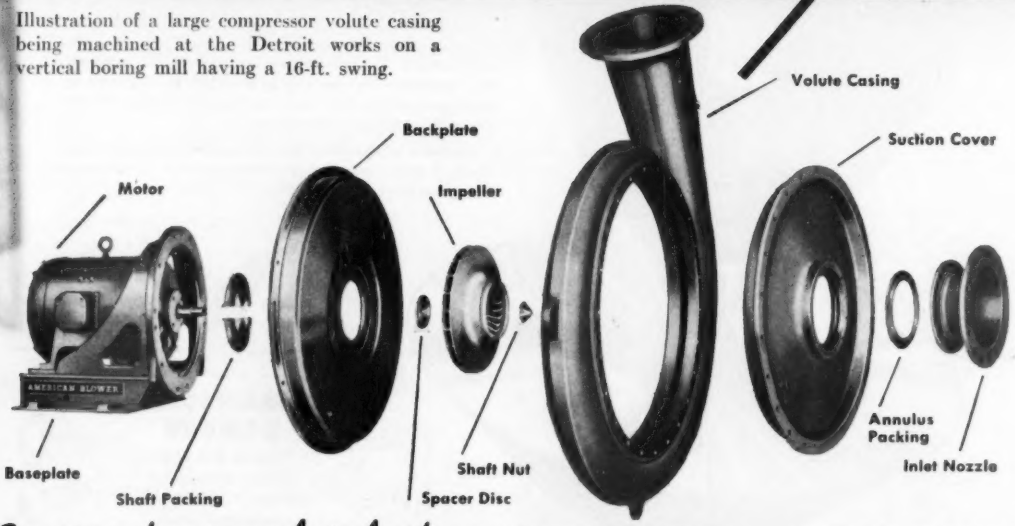



Illustration of a large compressor volute casing being machined at the Detroit works on a vertical boring mill having a 16-ft. swing.




*Serving home and industry:* AMERICAN-STANDARD • AMERICAN BLOWER

# AMERICAN BLOWER

# RIFUGAL COMPRESSORS

*Single Stage Design*
*Sizes: 30 to 600 HP*
*Pressures:*
*1 1/4 to 3 3/4 lbs.*

Take an excellent design, quality materials, modern machine tools, superior research and testing facilities, skilled engineers and craftsmen — and you have the important factors behind American Blower's outstanding line of centrifugal compressors. To you, this insures a quality product built and backed by a great name in air handling.

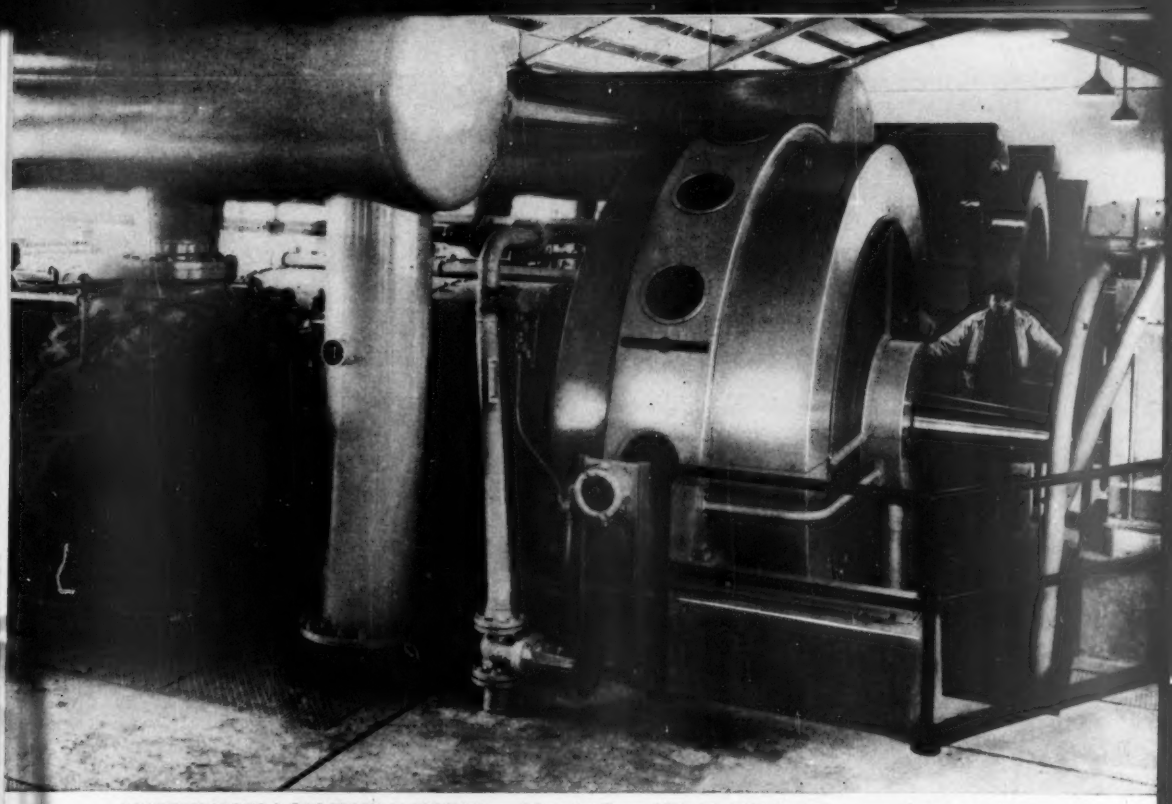
American Blower Centrifugal Compressors efficiently deliver large volumes of air or gases. They're compact, require minimum foundations and are adaptable to all types of drives.

Next time you want bids on centrifugal compressors, why not call in American Blower, too? Contact our nearest branch office for preliminary technical data or write us for Bulletin 109.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary corporation

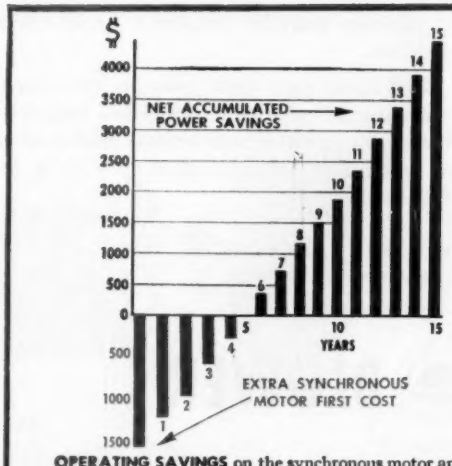
**AMERICAN BLOWER**

CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON



**COMPRESSORS IN A GAS STORAGE STATION** are driven by General Electric 3000 hp, 300 rpm synchronous motors.

# Can synchronous motors cut




**OPERATING SAVINGS** on the synchronous motor application described above are shown over a period of twenty years. Extra first cost will be amortized in five years; savings will continue for many more.

## Here's how one plant saves with a G-E Synchronous Motor

The specifications for a new pump motor were 250 hp, 600 rpm, 2300 volts, 3 phase, 60 cycle. The price of a 1.0 Power Factor synchronous motor, including exciter and control, was higher than an equivalent squirrel-cage induction motor with control. However, the synchronous motor efficiency, including exciter loss, was 1.6% higher than the induction motor (93.0% vs 91.4%). Since the motor was to operate continuously at a power cost of 11 mils per kilowatt-hour, it was found that the power savings would repay the additional investment in only five years. The operating savings will continue throughout the life of the motor—10, 20, even 30 years.

Savings such as these make synchronous motors the most economical drive for many heavy-duty, continuous-service applications. And in many cases, synchronous motors are lowest in first cost, too.

**GENERAL ELECTRIC 400 HP SYNCHRONOUS MOTORS** are coupled to ten Jordans in a paper mill.

# your plant's operating costs?

## Greater Efficiency on Large, Constant-Speed Applications Can Lower Power Costs Substantially

On certain applications selection of General Electric synchronous motors can bring about substantial savings in plant operating costs. Synchronous motors usually have a higher full-load efficiency than any other type of motor, produce more work per dollar's worth of power consumed.

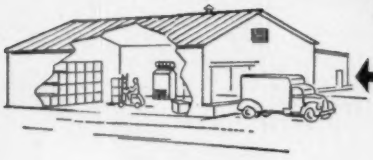
Furthermore, synchronous motors may be able to improve plant power factor—the ratio of total kilowatt load to total kva load. When these two fall out of balance, high system losses, high power bills, or increased maintenance costs commonly result. Using a *unity power factor* synchronous motor adds only to total kw load. And, a *leading power factor* synchronous motor will actually supply reactive kva's to your system, while operating at its normal rated output.

Before you select a drive for a large piece of equipment providing heavy and continuous service, be sure to investigate the economics of General Electric synchronous motors. Call in your G-E representative—he'll be glad to discuss your situation with you. Also, information on G-E synchronous motors and their application is available in the following bulletins: GEA-5332, "Low-Speed Synchronous Motors;" GEA-5426, "High-Speed Synchronous Motors;" GEA-5817, "Plant Power Factor Improved With G-E Synchronous Motors." Write to Section 770-27, General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

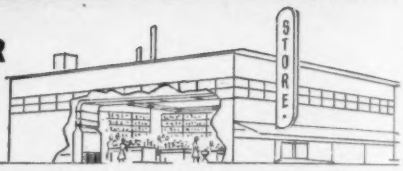
# DRAVO *Counterflo*

## A POSITIVE *SOLUTION* FOR



### 1. INDUSTRIAL CENTER

Where space is limited or roof heat losses are unusually high, Dravo Heaters require minimum space . . . no expensive boiler plant; roof heat losses low due to controlled recirculation of air; can be used with or without ducts.




### 3. SUPERMARKET

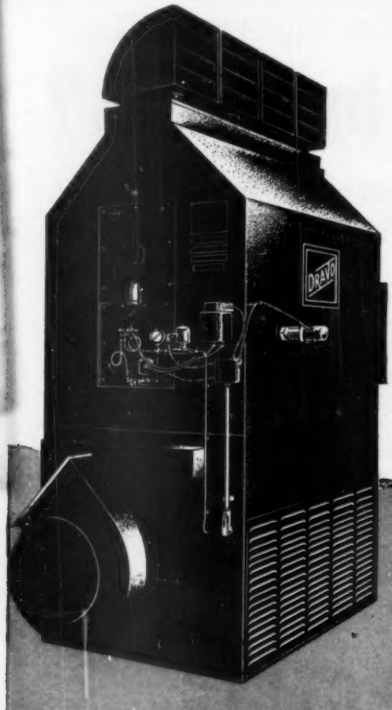
In heating, ventilating and air conditioning large areas, Dravo Heaters can tie in with air conditioning system by using same duct work, provide year-'round comfort.

### 2. FOUNDRY

Negative pressures, caused by exhausting foul air, are balanced by tempering fresh outside air with Dravo Heaters. Atmosphere is kept healthy, constant temperatures are maintained, worker efficiency improves.

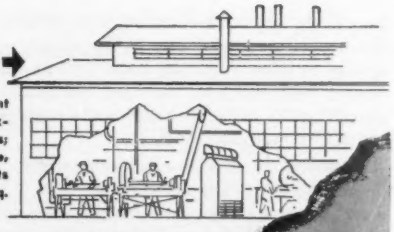
### 4. MEDIUM-TEMPERATURE CURING

In controlling temperatures and air moisture content in process manufacturing, Dravo Heaters have automatic controls, maintain constant temperature, can recirculate air to control curing process.




### 5. MACHINE SHOP

For comfort heating large plant areas, Dravo Heaters have maximum air throw in all directions; can be turned off during idle time, warm up quickly, keep fuel costs low, can heat 4,000 to 20,000 sq. ft. area, no duct work required.



Approved by American Gas Association

Listed by Underwriters' Laboratories, Inc.

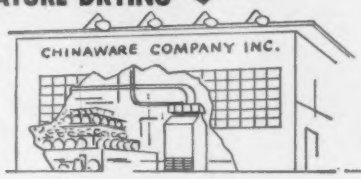
ACCEPTANCE BY FACTORY MUTUAL ENGINEERING DIVISION OF DRAVO STANDARDIZED SAFETY CONTROL CIRCUIT.

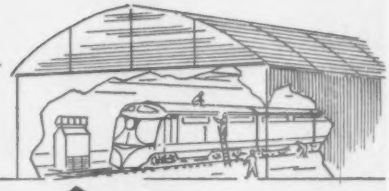
# HEATERS.....

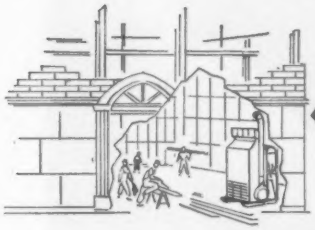
## 8 DIFFERENT HEATING PROBLEMS!

### 6. MEDIUM-TEMPERATURE DRYING

In removing moisture in drying operations, Dravo Heaters provide low-cost heat at even, predetermined temperatures; are automatic in operation, can use gas or oil, are readily converted.





### 7. TEMPORARY HEATING

For building construction projects where ground temperature must be kept above freezing, Dravo Heaters are quickly installed, easily moved to any location; can be later used as permanent heating plant for the new building.

### 8. RAILROAD REPAIR SHOP

In providing ample heat for repairmen in large buildings, Dravo Heaters keep heat where it's needed . . . at the working level; directional nozzles easily adjusted to suit conditions; heaters can be mounted on walls or hung from ceiling in any position.

## DRAVO *Counterflo* HEATERS CAN SOLVE SIMILAR PROBLEMS IN THESE INSTALLATIONS, TOO

**Comfort Heating and Ventilating** in schools, churches, auditoriums, laundries, restaurants, garages, factories.

**Process Drying** of wood, rubber and paint; rug drying; auto laundry operations.

**Process Curing** of concrete pipe linings, farm crops, paper and fibres.

## DRAVO HEATERS OFFER YOU . . .

- Low initial cost—users report 30% to 60% savings.
- Easy installation—electrical, fuel and exhaust connections are only requirements.
- Flexibility—where floor space is limited, can be wall-hung or suspended from trusses.
- Low fuel cost—direct-fired . . . burn gas or oil . . . units readily converted.
- Automatic operation—on-off or modulating controls.
- Long service life—stainless steel combustion chamber eliminates refractory lining . . . low maintenance costs.

**MAIL THIS COUPON FOR MORE INFORMATION . . .**

**DRAVO**

CORPORATION

PITTSBURGH • ATLANTA • BOSTON • CHICAGO • CLEVELAND
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Manufactured and sold in Canada by Marine Industries, Ltd., Sorel, Quebec. Export Associates: Lynch, Wilde & Co., Washington 9, D.C.

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☐ Please have a representative call.

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# TO CUT COSTS...ever think of

# Only CARBO

TRADE

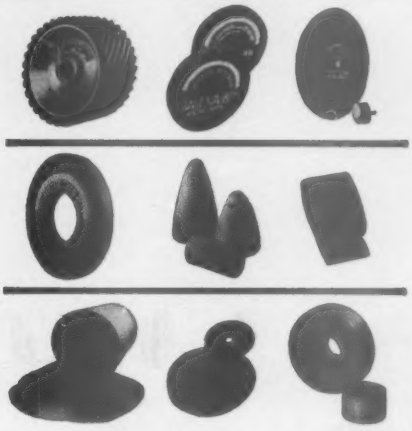
*"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, New York.*

# switching to an abrasive BELT?

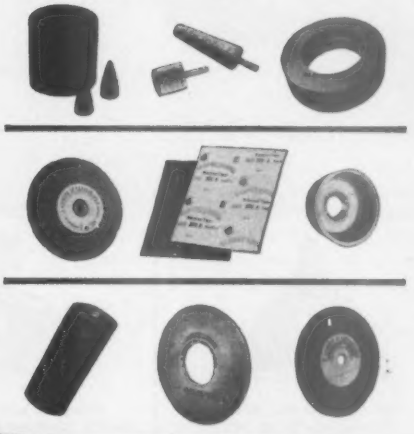
**Grinding and polishing techniques** have undergone major improvements in the past few years. One of many revolutionary developments is the "61" contact wheel, used with a coated belt on many operations previously performed with a bonded or a set-up wheel. In every case, the change has been made for just one reason —to yield a better result at a lower cost.

**This is the kind of change** that spells progress to every metalworking man who is battling against higher and higher costs. And this is the reason why you should welcome the CARBORUNDUM man or distributor salesman when he calls on you. There is nobody quite like him, for he's not in the position of having to back just one type of product, or two. He alone has the ability to help you specify the one RIGHT combination of abrasive product and abrasive method for every operation in your shop.

**His counsel** is experienced, practical, and above all completely free from bias—for he represents the only complete line of abrasives, from CARBORUNDUM, the world's best known brand name in abrasives. We suggest that you call him in today—it's to your profit!



**Here are only a few of the 30,000 reasons why you get the RIGHT combination of abrasive and method only from CARBORUNDUM**



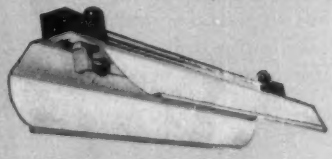
# RUNDUM

MARK

**offers ALL abrasive products...to give you the proper ONE**

400 or 1,000-watt millite luminaires, 18′ to 30′.

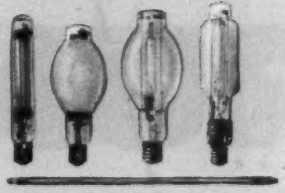
400-watt, lock-lite luminaire, used in machine shop shown above.



3,000-watt mercury luminaire, 40′ and over.

1,000-watt mercury high-bay, 25′ and over.

Complete range of ballasts for high or low-voltage systems.



Complete range of lamps, including new color-corrected J-H1, 400-watt lamp.

# More light for 1/3 less cost

## *with Westinghouse MERCURY lighting*

Today's mercury lighting systems produce more light per luminaire than any other lighting system. That's why it's economically practical to step up your lighting standards and still save money.

For example, in the case of this machine shop in California, an engineering cost analysis showed a saving of 30% on initial cost, as compared to other systems considered. Efficiency really improved. Employees go so far as to say, "It's easier to see on the night shift now, than it is on the day shift". Here's evidence that the working area is shadow free.

What's more, maintenance costs are drastically cut with mercury lighting. Less than half as many fixtures to maintain—fewer lamps to replace.

It's important to you to investigate Westinghouse mercury lighting systems. You'll find a complete line for every phase of plant operation: 400, 1,000, 3,000-watt units for low or high-bay areas—open or closed fixtures for clean or dirty locations—low or high-voltage ballasts for any distribution system. Only Westinghouse can furnish you a complete mercury lighting system. Send today for B-4727, "Westinghouse Lighting at Work in Every Industrial Area", Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Penna.

J-04321

YOU CAN BE SURE...IF IT'S

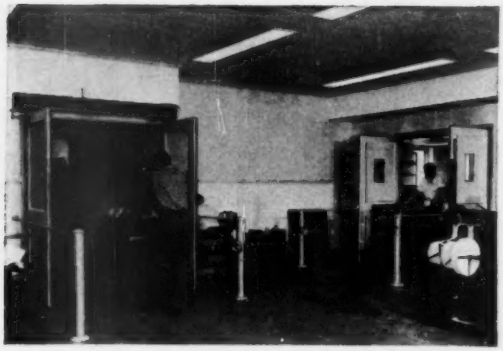
**Westinghouse**

**LIGHTING DIVISION**

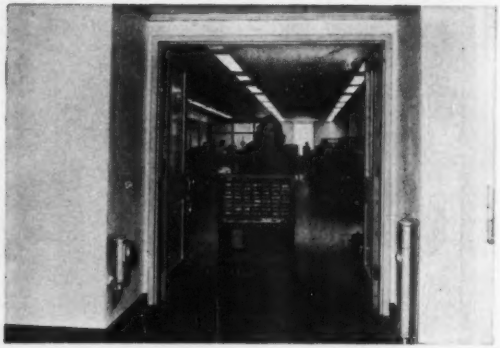
Edgewater Park, Cleveland, Ohio

# Employees PREFER to work at the READER'S DIGEST plant!

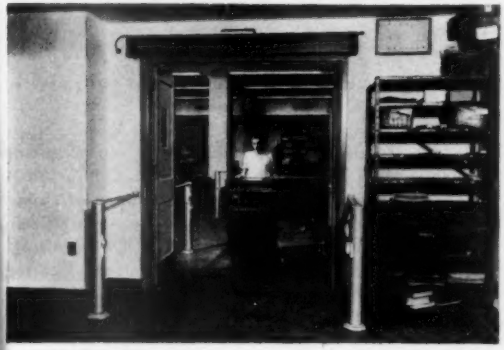
**. . . where newly-installed STANLEY MAGIC DOOR CONTROLS simplify the many handling tasks . . . help attract and hold high-grade personnel.**



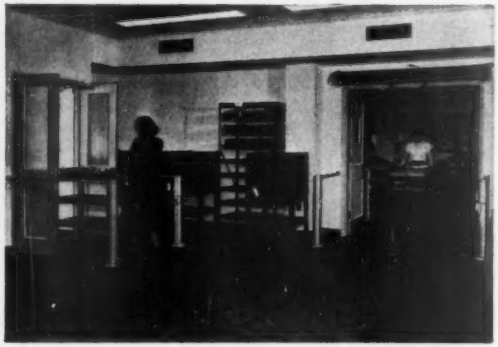
**Carts move mountains of stencils in and out of addressing department through Stanley Magic Doors, actuated by photoelectric controls. Traffic flows smoothly and quickly because . . .**



**Doors open on approach, stay open until passage is clear, then close quickly and silently. Noise from machines is kept out of surrounding departments.**



**Costly spilling avoided—Stanley Magic Doors don't bang or rub against the carts and overturn stencils, mixing them up. Time is saved . . . employee morale preserved.**



**No damage to doors or carts because there's no contact between them. Maintenance and repairs are minimized. The work of opening and closing doors is eliminated.**

The Stanley Works, Magic Door Division
30012 Lake St., New Britain, Conn.

Gentlemen: ( ) Please send full information on Stanley Magic Door Controls. ( ) Have your representative call.

Company Name _____

My Name _____

Address _____

City _____

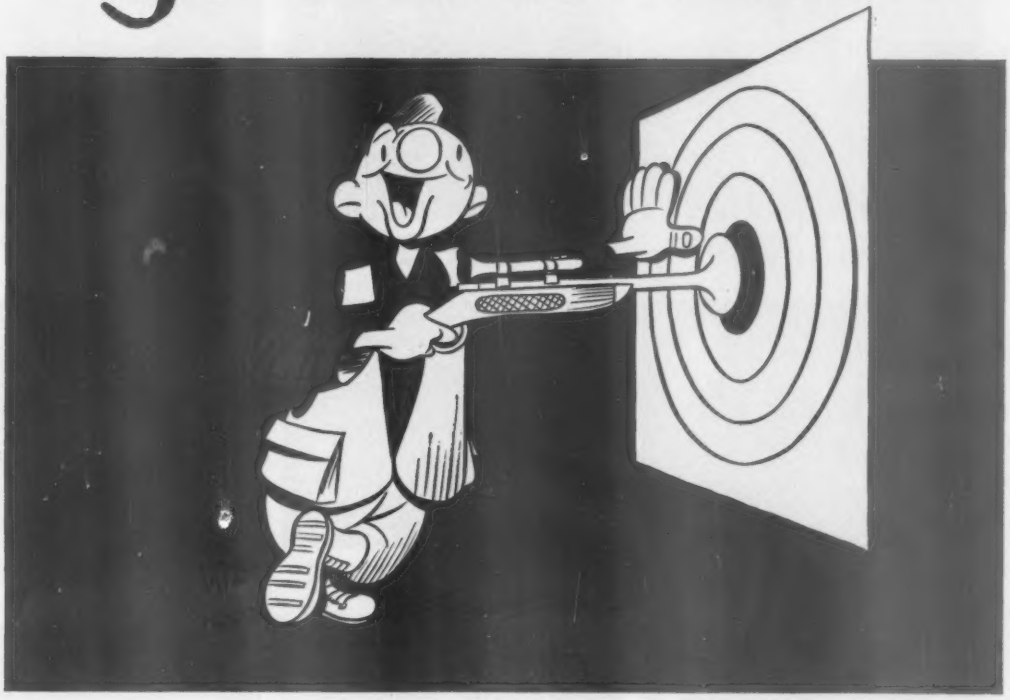
State _____

STANLEY® *Magic Door* CONTROLS

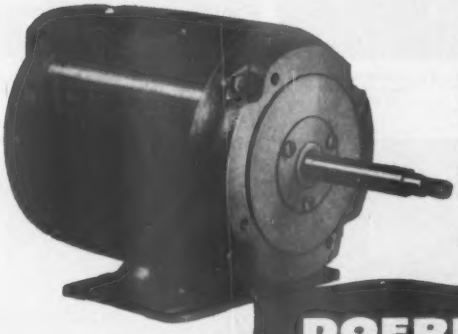
**STANLEY TOOLS • STANLEY HARDWARE • STANLEY ELECTRIC TOOLS • STANLEY STEEL STRAPPING • STANLEY STEEL**

*If your plant* uses conditioned air, remember that correct temperature and humidity are easier to maintain with Stanley Magic Door Controls. Available in many types for varied applications. Years of dependable operation in hundreds of plants have proved their long-term efficiency. Ask for complete facts about installation on your present doors, whether they swing, slide or fold. Send the coupon now.

# You CAN'T MISS



## when you buy DOERR MOTORS



If you haven't had a chance to investigate this versatile line of motors regularly used by an outstanding list of machinery manufacturers, it would be well worth your while to learn about the many advantages of using Doerr Motors. Special features and modifications of all types can be furnished, as well as a complete line of standard NEMA ratings. *Write today for more information on DOERR MOTORS.*

**Pump motor with special machined face mounting and stainless steel shaft with threads and Woodruff keyway.**

***Electric Motors from 1/30 to 5 hp. Standard, or designed to your specification.***

YOU GET MORE WITH *DOERR!*

**DOERR**
*Electric Corporation*
CEDARBURG, WISCONSIN

**DOERR ELECTRIC CORPORATION, Cedarburg, Wisconsin Dept. F**

Please send your new bulletin on electric motors, without obligation.

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COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

# STEELWELD BENDING

Large cylindrical sections for boilers, buckets, drums, are easily made with standard bending dies.

Drawers, file cases and other equipment requiring sharp bends are produced accurately and quickly.

Conical sections are quickly formed with standard bending dies by use of the ram-tapering mechanism.

Neatly rounded flanges can be formed on several panels at every stroke of the press.

With a simple attachment this model F3-10 press punches large diameter holes (5" dia. in 10-gauge and 8" dia. in 12-gauge plate) in fast time.

Corrugating and any straight-line production bending can be done to hairline accuracy.

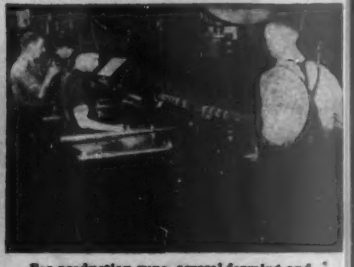
Smooth curves of practically any shape can be readily formed with standard or simple dies.

Various bending and edging operations are easily performed. Here the edge of a panel is being wrapped around a pipe for rigidity.

Producing a 6-inch diameter cylinder. Parts like this can be formed in lengths up to 20 feet.

Punching 130 holes ranging from .078" to .250" at one time is easily done on a Steelweld Press.

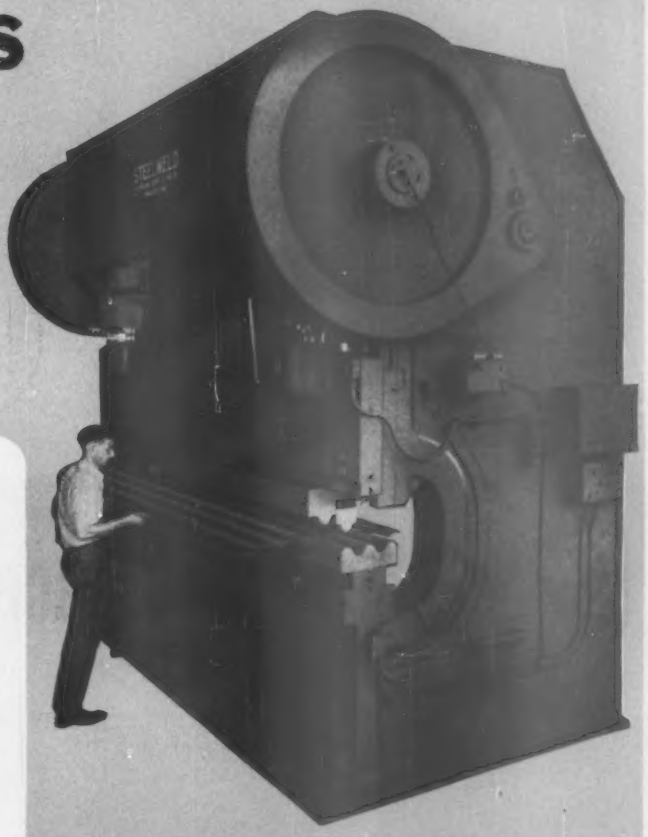
Holes are punched, corners notched and the plate finally formed with dies shown. See finished part at left.



For production runs, several forming and punching operations may be handled at each stroke of the ram.

# PRESSES

## *Speed Production of Dozens of Varied Jobs*



For anyone working with metal—steel, aluminum, dural, monel, stainless steel, etc.—in any thickness up to one inch and lengths to 20 feet, Steelweld Presses offer important advantages—advantages that can have direct bearing on the future success of a department or entire business.

They make possible easy fabrication of parts that by ordinary methods would be difficult and expensive. They speed production and lower costs because press work is fast. After easily-inserted dies are setup, parts may be formed as quickly as they can be placed into or removed from a press.

Steelweld Presses are versatile. Any of the various operations illustrated at left are easily performed on any machine.

Hundreds of Steelweld Presses are serving leading concerns in the United States and many foreign countries.

### A FEW OF MANY FEATURES

1. All-welded one-piece steel frame with box-type end housings and heavy steel throat forgings.
2. Extra deep throat—18" standard. May be up to 36" for some models.
3. Six exceptionally large main bearings.
4. Clutch and brake easily adjusted without tools.
5. Smooth velvet-touch control. Ram stops with extremely little drift.

***GET THIS BOOK!***

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

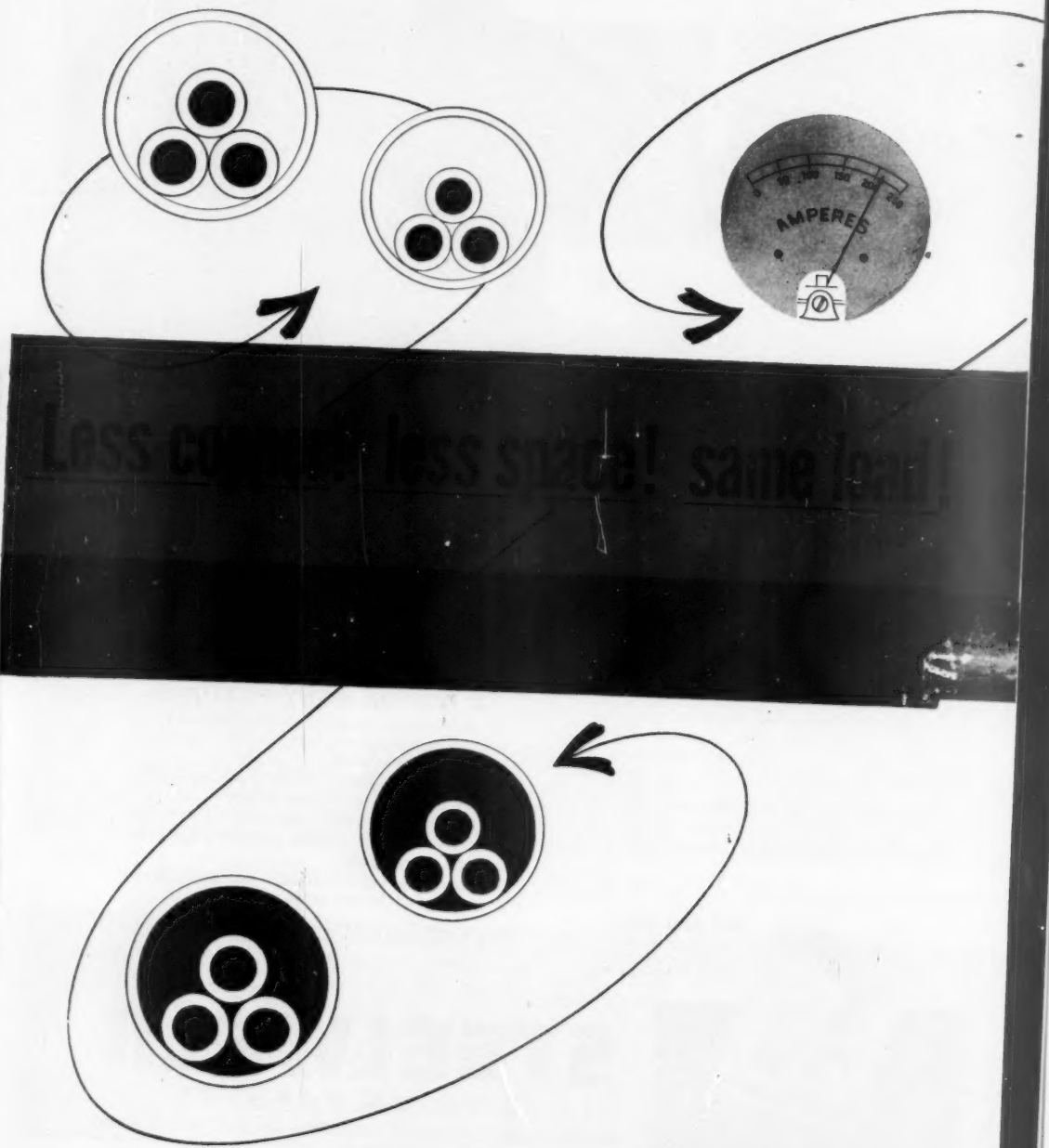
**THE CLEVELAND CRANE & ENGINEERING CO.**

*3228 EAST 281ST STREET* *WICKLIFFE, OHIO*

# STEELWELD

## *BENDING PRESSES*

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING


AMPERES

Faced with an overloaded, out-of-date wiring system? Then consider NEasbestus, National Electric's asbestos-varnished cambric wires and cables. With NEasbestus you buy *less* copper, require *less* conduit space, yet deliver the *same load!*

NEasbestus wire can permissibly operate at higher temperatures than the same size rubber or thermoplastic insulated conductors according to the National Electrical Code. Thus, you can use smaller sizes of NEasbestus wire to carry a given load. For example:

Size 500 MCM-RH—capacity 380 Amperes.

Size 350 MCM-NEasbestus—
capacity 390 Amperes. (Approximately 20% savings in cross-sectional area)

Size 1000 MCM-RH—capacity 545 Amperes.

Size 700 MCM-NEasbestus—
capacity 560 Amperes. (Approximately 27% savings in cross-sectional area)

*With NEasbestus* wire you can use your present conduit—save the cost of new, enlarged conduit runs and resultant structural alterations. Just pull out the old wires, pull in NEasbestus.

- Save the cost of new, larger-sized cable.
- Save major carpentry, plastering, painting repair bills.

For maximum continuous operations in external or *internal* hot spots, install NEasbestus today. There's a sales office near you.

***Write today for the free NEasbestus catalog***

# National Electric Products

PITTSBURGH, PA.

3 PLANTS / WAREHOUSES 42 SALES OFFICES

Steam...
or
Gas-fired...
Built in Horizontal (illustrated), Vertical Delivery and Power Throw types — 47 different models.
Five popular sizes, A.G.A. approved for natural, mixed, manufactured, L.P. and L.P.-air gases.

# Modine builds a unit heater to match your heating requirements

**Whether it's steam, hot water or gas . . . look to Modine for the *right* unit heater**

WHATEVER your unit heating requirements, you can match them exactly from the complete Modine line. Because Modine builds steam, hot water *and* gas-fired units, you're sure of an unbiased recommendation. And, remember, when you buy Modine, you buy the greatest name in unit heating. As a leader in this field for more than 25 years, Modine gives you balanced heating performance — perfect heating comfort plus maximum fuel economy. Get all the facts. See the Modine representative listed in your classified phone book, or write Modine Mfg. Co., 1505 DeKoven Ave., Racine, Wis.

## *Modine* STEAM AND HOT WATER UNITS

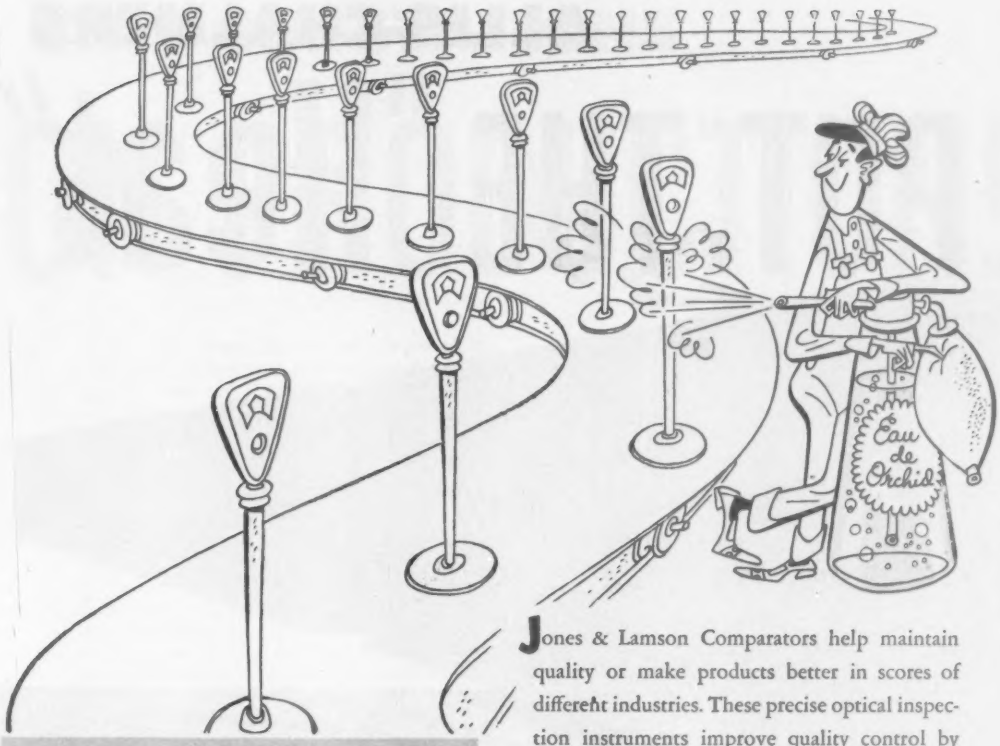
Special heating coil designs for steam and for hot water assure best performance for each type of system. Discharge air temperatures of 110-120° F are correctly related to air velocity for heating at its best. All-copper coils defy corrosion because fins are bonded to tubes and tubes are brazed to headers. Pre-formed tubes with individual expansion bends absorb stresses, assure long life.

## *Modine* GAS-FIRED UNITS

Modine is the only gas unit with both *stainless steel* heat exchanger and burner. Lighter weight means easier, less expensive installation, plus faster heat delivery — *within five seconds* after thermostat calls for it. Individually fired tubes provide higher heat transfer. Elongated ports — four times free area of conventional drilled ports — minimize clogging and simplify routine cleaning. U-1186

Ask for Bulletin 149-A on steam and hot water and Bulletin 652 on gas unit heaters

*Modine* UNIT HEATERS




# make your product BETTER!

Jones & Lamson Comparators help maintain quality or make products better in scores of different industries. These precise optical inspection instruments improve quality control by providing a more accurate means of inspection and measurement. J & L Comparators inspect and measure parts and products ranging in size and variety from pen points to propeller shafts and dental burrs to bottle caps. Quite possibly, you can make *your* product better and for less by using J & L Comparators.

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for Jones & Lamson's new booklet, "Comparators — what they are and what they do." It describes the Comparator in non-technical language.

**Jones & Lamson Machine Company**
**Springfield, Vt., U.S.A., Dept. 710-F**

*Gentlemen: Please send me your booklet, "Comparators — what they are and what they do."*

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TITLE_____

COMPANY_____

STREET_____

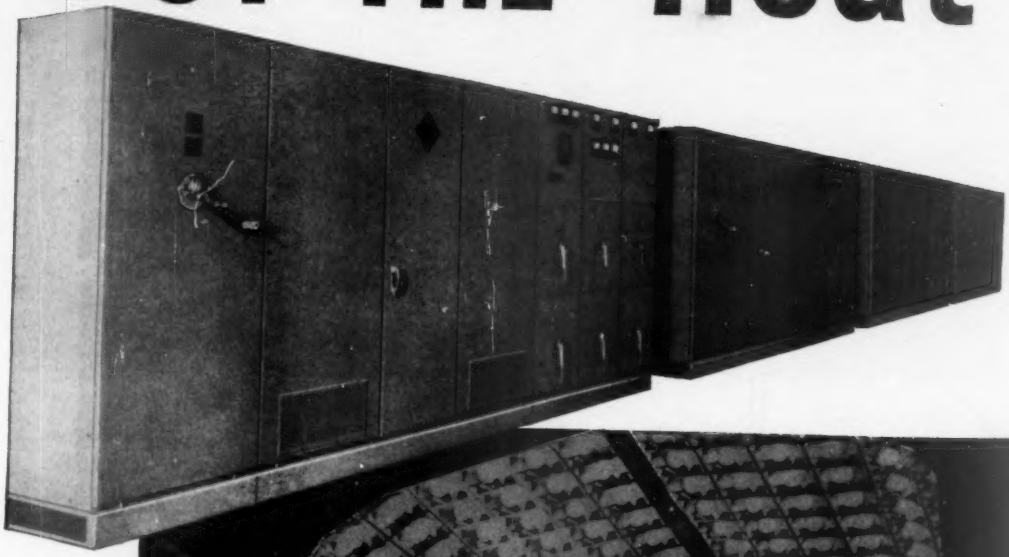
CITY_____ ZONE____ STATE_____

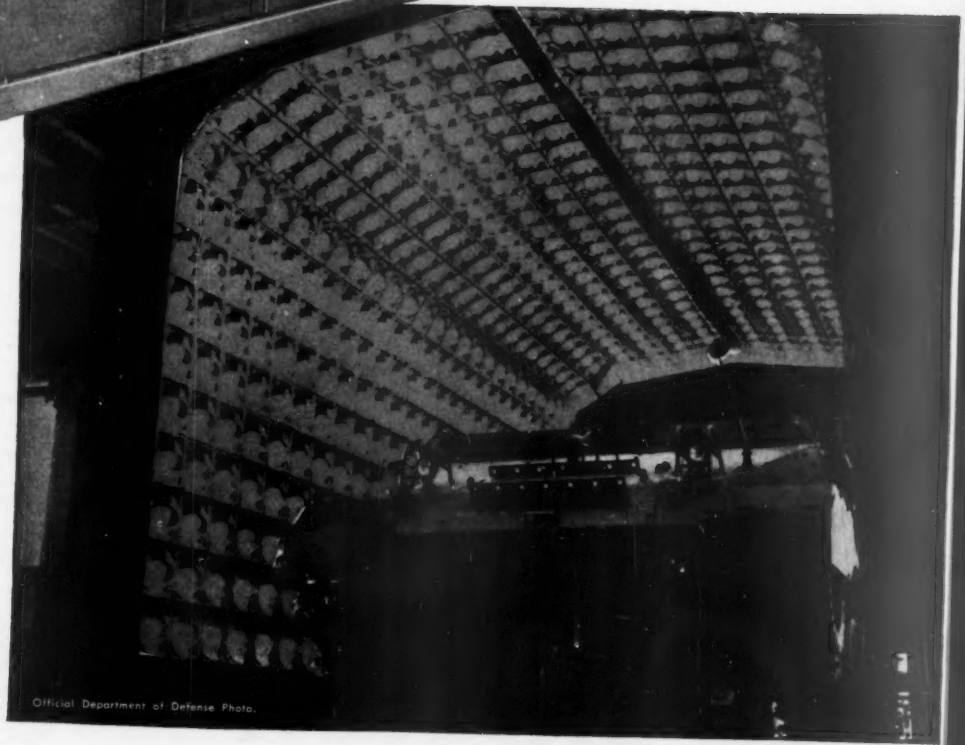
# JONES & LAMSON

**JONES & LAMSON MACHINE COMPANY**
Springfield, Vermont, U. S. A.
*Machine Tool Craftsmen Since 1835*

**COMPARATOR DIVISION, DEPT. 710-F**

# ALLIS-CHALMERS PUT THE "Heat"





Official Department of Defense Photo.

# UNIT SUBSTATIONS

# ON PRODUCTION!

YOU CAN INCREASE the production of your plant without adding production equipment or hiring more help . . . just eliminate undervoltage. Motors, lights, heating units—all electrical equipment gives top performance only when operated at full voltage.

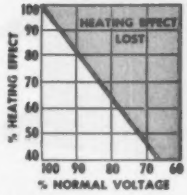
Paint baking or drying operations take longer when voltage drops. For example, a 10% drop reduces heating effect of infra-red lamps 19% . . . slows production. One paint drying operation required 63% more time when voltage dropped 10%.

A major cause of undervoltage is long, heavily loaded 480 volt feeders. Install Allis-Chalmers LCS Unit Substations at load centers and eliminate excessive line drop by shortening low voltage cables. Performance of all electrical equipment will improve . . . and personnel efficiency will increase because of better illumination from existing lighting fixtures.

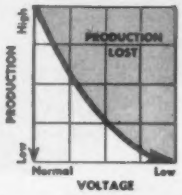
You can count on the cooperation of experienced Allis-Chalmers substation engineers in working out your distribution system. Allis-Chalmers LCS Load Center Unit Substations are neat, compact, easy to install and provide protection to personnel. Get in touch with your A-C representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-3372

**LCS Unit Substations**

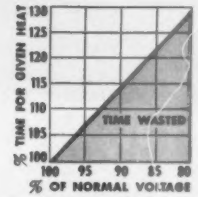
## HOW UNDERVOLTAGE WASTES MANHOURS . . . CUTS PRODUCTION



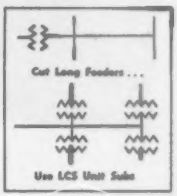

**FULL OUTPUT** from existing equipment demands full voltage. Heat output of infra-red lamps (used for baking paint on metal, drying coils of electrical apparatus and similar applications) drops with undervoltage. Output of resistance furnaces also drops off as the square of undervoltage.




**PRODUCTION LOSSES RESULT** from undervoltage. In one case a 10% drop in voltage cut the output of an infra-red drying oven from 1500 pounds per hour to 1275. Undervoltage means less work done each day . . . greater overhead for the work done, more manhours to be figured into every job.

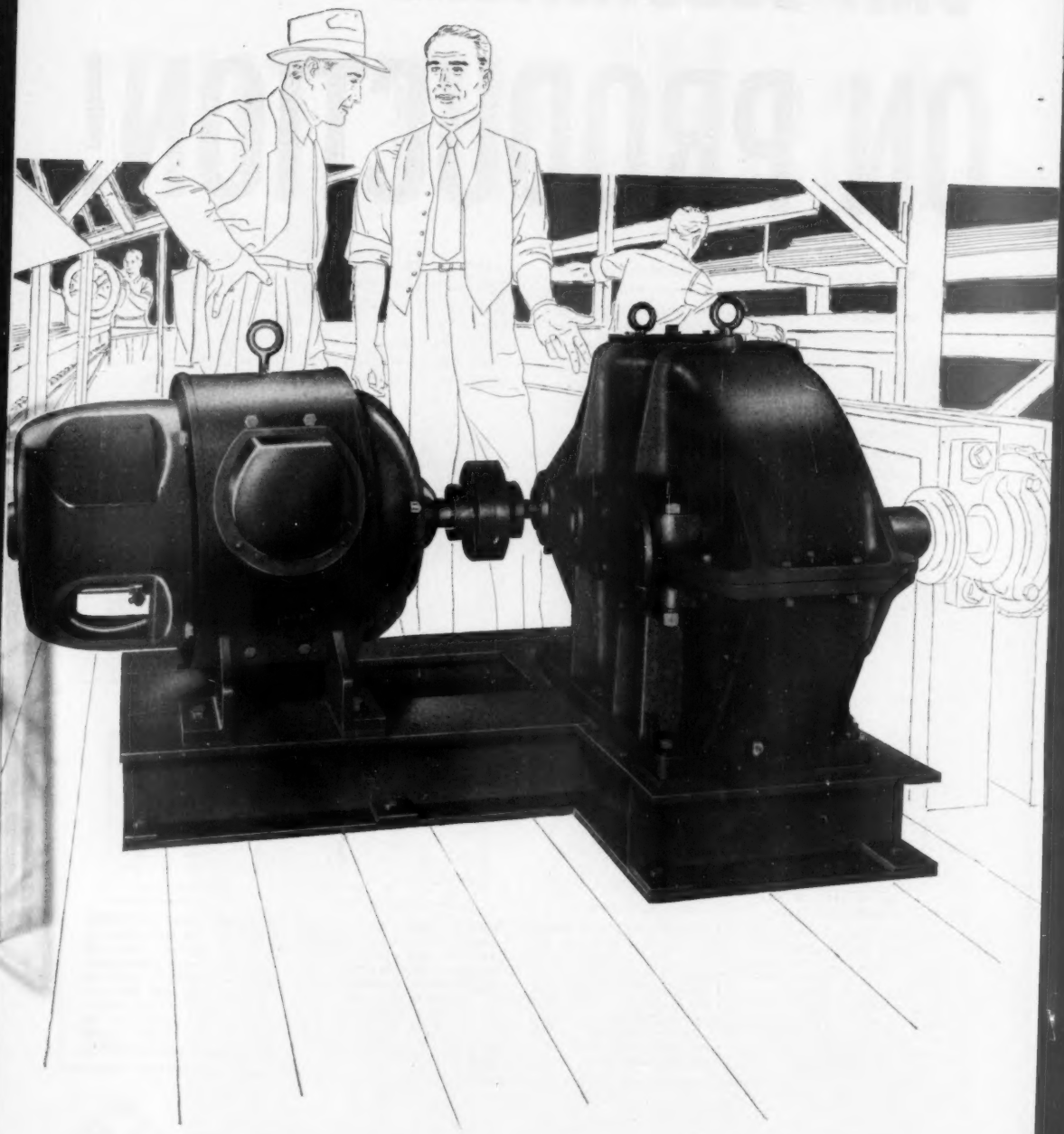



**TIME IS WASTED** when undervoltage is distributed to infra-red bulbs and other heating devices. It takes longer to deliver the same amount of heat . . . longer to do a given job. In one plant, drying time for black painted sheet steel increased from 11 to 18 minutes by a 10% drop in voltage.




**A MAJOR CAUSE OF UNDERVOLTAGE** is voltage drop in secondary feeders. Long low voltage lines may prove inadequate as production schedules are stepped-up and new machines added. Install substations at load centers to cut feeder length, reduce voltage drop and increase production.

# ALLIS-CHALMERS



# "I'll tell you why we buy these Westinghouse Drive Teams"

"We obtain exclusive benefits from the planning stage right on through the long life of the drive. You see, experienced Westinghouse Application Engineers know both mechanical and electrical drive problems. When we put our heads together, we always come up with a better drive solution.

"We also benefit every step of the way from ordering to maintenance because there's only one point of contact required—undivided responsibility. Westinghouse ability and willingness to handle our complete drive requirements sure saves us plenty of headaches. Saves our time and dollars, too.

"Experience has shown us that we can depend on a Westinghouse Speed Reducer. The taper-hardened, accurately hobbed gears, the rugged tight case, the efficient roller bearings, the positive lubrication system—all add up to a speed reducer that is second to none.

"The Life-Line d-c motor deserves its share of the credit, too. The features we especially like are the pre-lubricated bearings and the all-steel construction. We install a Life-Line motor and forget it."

The next time you have a drive problem, call in your Westinghouse representative. Remember—Westinghouse makes the complete drive.

Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

J-07307

## AT YOUR SERVICE

# OFFICES IN 70 CITIES

## COAST TO COAST

Aberdeen, Washington
Alhambra, California
Astoria, Oregon
Atlanta, Georgia
Bend, Oregon
Birmingham, Alabama
Boise, Idaho
Boston, Massachusetts
Bremerton, Washington
Butte, Montana
Cedar City, Utah
Cheyenne, Wyoming
Chicago, Illinois
Cincinnati, Ohio
Cleveland, Ohio
Council Bluffs, Iowa
Dallas, Texas
Denver, Colorado
Des Moines, Iowa
Detroit, Michigan
Eugene, Oregon
Fresno, California
Gering, Nebraska
Glendale, California
Hollywood, California
Kansas City, Missouri
Las Vegas, Nevada
Lewiston, Idaho
Lincoln, Nebraska
Long Beach, California
Longview, Washington
Los Angeles, California
Memphis, Tennessee
Milwaukee, Wisconsin
Minneapolis, Minnesota
New Orleans, Louisiana
New York, New York
Oakland, California
Ogden, Utah
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Pasadena, California
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Pittsburgh, Pennsylvania
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St. Joseph, Missouri
St. Louis, Missouri
Sacramento, California
Salina, Kansas
Salt Lake City, Utah
San Diego, California
San Francisco, California
San Jose, California
San Pedro, California
Santa Ana, California
Santa Monica, California
Seattle, Washington
Sioux City, Iowa
Spokane, Washington
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(And—in addition—passenger and freight representatives at all Union Pacific Railroad stations will be glad to assist you.)

## BE SPECIFIC "SHIP" UNION PACIFIC

# Gears for Every Purpose-

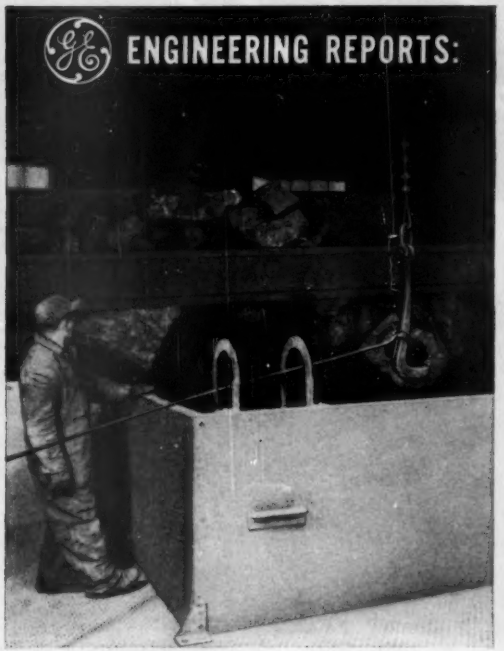
ANY TYPE

ANY SIZE

ANY MATERIAL

ILLINOIS GEARS — Gears for Every Purpose ... one gear or 10,000 or more

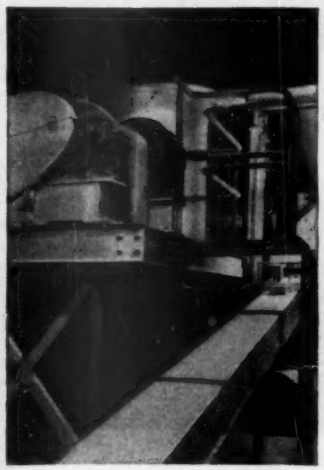
ILLINOIS GEAR & MACHINE COMPANY



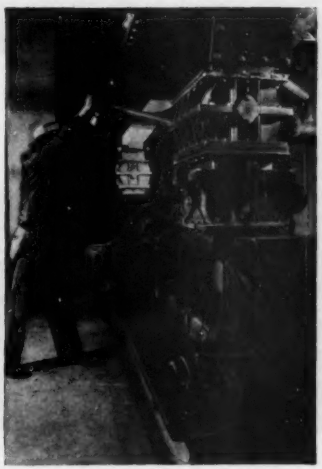

**1 LIMESTONE IS DELIVERED** in cars from quarry to primary crusher and hammermill. G-E powered crane is used by operator to keep rock from jamming in crusher.

**2 CRUSHED ROCK IS CARRIED** to storage by a 30-inch, 1200-foot-long conveyor. This sturdy G-E 60-hp motor starts the fully loaded belt without difficulty.

# Modern materials handling helps



**5 PULVERIZED STONE** is fed to kilns by screw conveyors (on platform) with G-E selsyn drives which co-ordinate screw speed and kiln rotation.



**6 FINISHED CEMENT** is pumped to packhouse by portable Fuller-Kinyon pumps. G-E 200-hp drives enable each to deliver 600 barrels per hour.

**7 CONVEYOR DELIVERS** filled bags to dock for loading into cars. Compact G-E gear-motor transmits maximum torque, provides uniform speed.

**3** **ROUGH BLENDING** is done in storage by two G-E powered heavy-duty d-c cranes which dump selected rock into hoppers for delivery to the raw-grinding mills.

**4** **FROM GRINDING MILLS**, pulverized stone is conveyed through a 10-inch pipe to blending bins. Fuller-Kinyon pump, G-E powered, pumps 120 tons per hour.

# Universal Atlas reach peak output

## G-E equipped system at Hudson, N. Y. cement plant keeps operation continuous from quarry to pack-house

Every continuous-process industry has the same materials-handling problem that Universal Atlas Cement Co. faced at their Hudson, N. Y. plant: *to minimize interruptions in the flow of materials being processed.*

Here's how Universal Atlas achieved this goal: Their engineers designed a materials-handling system made up of the most up-to-date equipment available. Plans included standby equipment and materials stockpiles at strategic locations to provide for necessary equipment maintenance. Then, reliable, long-life G-E drives were used for the entire system. The success of this carefully planned program is evident today when record production flows smoothly through the plant.

A modern materials-handling system integrated with production operations can eliminate bottlenecks and increase production in your plant. To help you achieve these goals, G-E application engineers are ready to work with you and your equipment manufacturer to solve electrical problems involved. Contact your nearest G-E Apparatus Sales Office today.

**Most efficient way to modernize shown in new PROGRESSIVE MECHANIZATION program**

To help you set up a step-by-step plan for bringing plant operations to peak efficiency, G.E. has developed the new Progressive Mechanization Program. Ask your G-E apparatus representative for details, or write to General Electric Company, Sect. 669-5, Schenectady 5, N. Y.

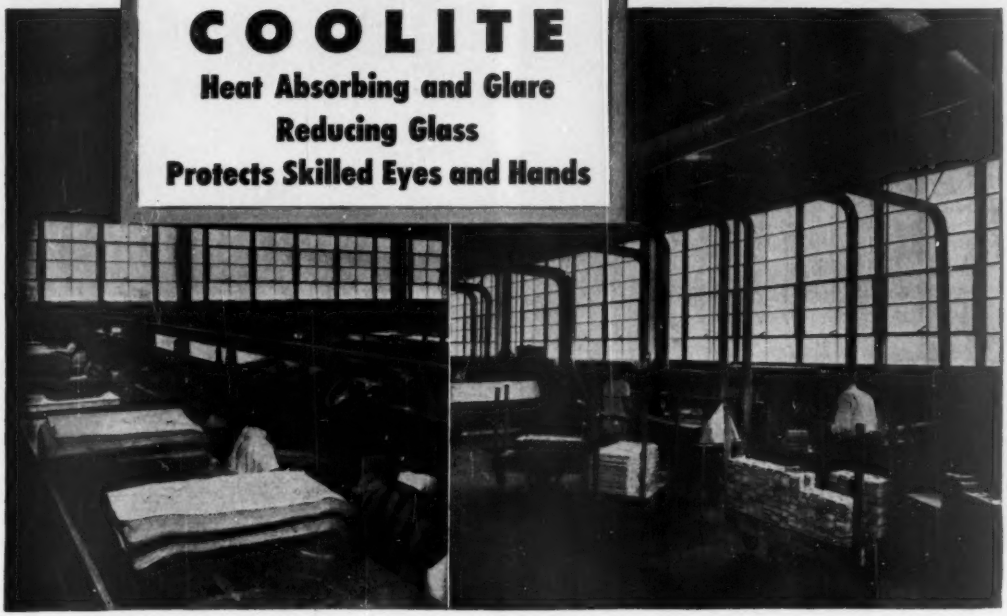
## Engineered Electrical Systems for Materials Handling

**Conveyor drives • Hoist drives • Industrial truck drives and battery chargers**

GENERAL ELECTRIC

# Craftsmanship calls for COOLITE

## Heat Absorbing and Glare Reducing Glass Protects Skilled Eyes and Hands



Architect—J. N. Pease & Co., Charlotte, North Carolina
General Contractor—Inge-Hayman Construction Co., Inc., Dallas, Texas
Glazing Contractor—Pittsburgh Plate Glass Co., Charlotte, North Carolina

## Kroehler, Famous Name in Furniture, Chooses COOLITE GLASS by Mississippi

Kroehler Manufacturing Co. safeguards the high quality of its famous furniture by flooding workrooms with filtered daylight. Three exposures in this modern factory are glazed with 5800 square feet of Coolite, Heat Absorbing and Glare Reducing Glass. The precise workmanship of the woodworking shop and careful skill of the sewing department would be difficult to maintain under the eye-fatiguing glare of raw sunlight. But Glare Reducing Coolite strains out the unwanted properties in natural light . . . floods rooms with softened illumination that aids seeing tasks . . . keeps interiors more comfortable by helping to absorb solar heat rays.

Coolite has a refreshing, cool, blue-green color, modern in appearance. It reduces maintenance . . . no painted windows, makeshift shields or bothersome blinds. If you are planning new construction or modernizing existing facilities, investigate Coolite. See how it can provide increased efficiency and economy for you. Get in touch with your nearby Mississippi Glass distributor today.

**Mississippi offers a wide variety of patterns in translucent, figured and wired glass. All are scientifically designed to distribute daylight to best advantage. "Visioneer" your buildings with glass by Mississippi.**

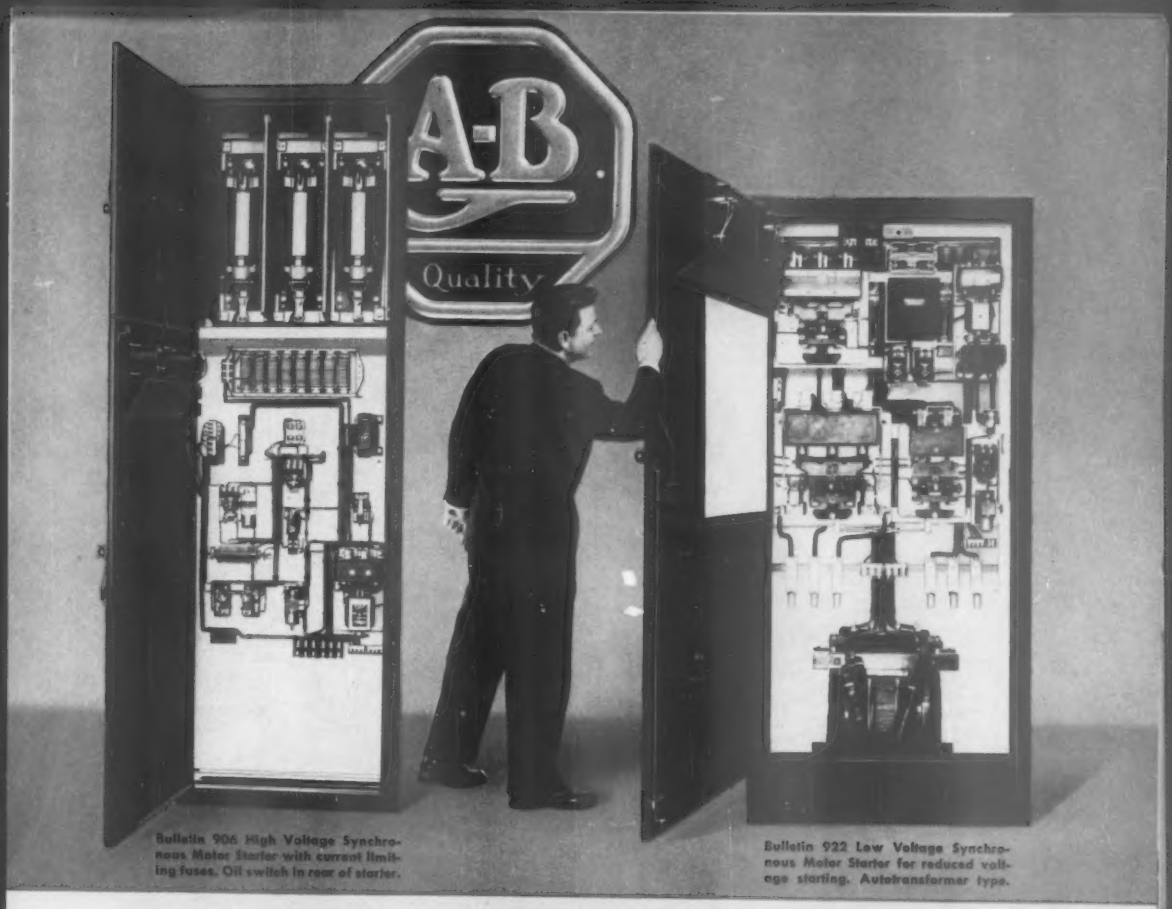
**Send for free catalog, "Coolite Heat Absorbing and Glare Reducing Glass." Samples on request.**

**MISSISSIPPI Glass COMPANY**

88 ANGELICA ST. SAINT LOUIS 7, MO.

NEW YORK • CHICAGO • FULLERTON, CALIF.

WORLD'S LARGEST MANUFACTURER OF ROLLED, FIGURED AND WIRED GLASS




Bulletin 906 High Voltage Synchronous Motor Starter with current limiting fuses. Oil switch in rear of starter.

Bulletin 922 Low Voltage Synchronous Motor Starter for reduced voltage starting. Autotransformer type.

# STARTERS FOR BIG MOTORS

| Bulletin Number | Type of Motor | Operation | Maximum Horsepower 208-220v | 440-550v | 2000-2500v | 2501-4600v |
|---|---|---|---|---|---|---|
| 646 | Sq. Cage | Manual | 125 | 250 | — | — |
| 726 | " " | Automatic | — | — | 700 | 700 |
| 740 | " " | " | 300 | 600 | — | — |
| 741 | " " | " | 300 | 600 | — | — |
| 742 | " " | " | 300 | 600 | — | — |
| 746 | " " | " | 300 | 600 | — | — |
| 747 | " " | " | — | — | 700 | 70 |
| 904 | Synchr. | Manual | 125 | 250 | — | — |
| 906 | " | Automatic | 350* | 700* | 900* | 90 |
| 914 | " | " | 250* | 250* | — | |
| 922 | " | " | 350* | 700* | 900* | 9 |

(*) At 100% power factor

● The motor starters, shown above, are examples of the many big units in the Allen-Bradley line.

Various types of manual or automatic starters for synchronous motors are available . . . up to 900 hp., 220 to 4600 volts.

High voltage squirrel cage automatic motor starters are listed up to 700 hp., 2000 to 4600 volts. Relays and contactors are time-tested A-B designs, fully protected when specified, by current limiting fuses.

The A-B Handy Catalog is a convenient manual on motor controls . . . large or small. Write for it, today!

Allen-Bradley Co., 1316 S. Second St.,
Milwaukee 4, Wis.

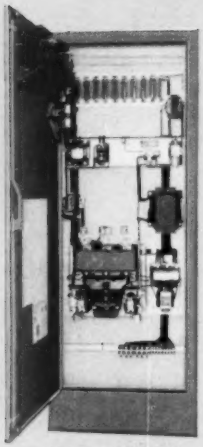
B-52—MR

A-B

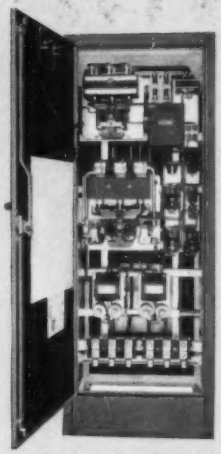
ALLEN-BRADLEY

QUALITY

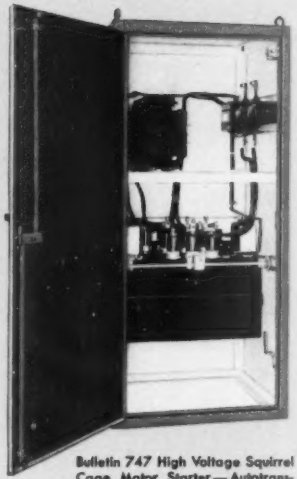
MOTOR CONTROL



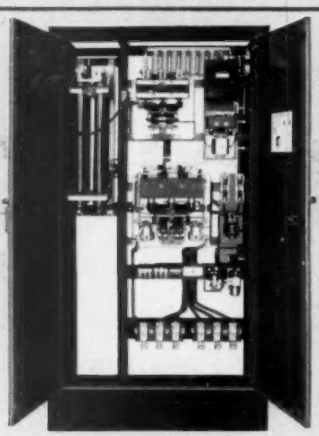
Bulletin 906 Low Voltage Synchronous Motor Starter—Full Voltage Type—Automatic Operation



Bulletin 742 Low Voltage Squirrel Cage Motor Starter—Stepless Resistance Type—Automatic

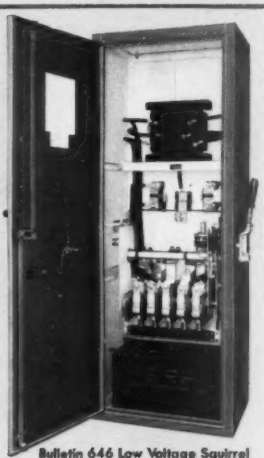


Bulletin 747 High Voltage Squirrel Cage Motor Starter—Autotransformer Type—Automatic Operation



Bulletin 914 Low Voltage Synchronous Motor Starter—Resistance Type—Automatic Operation

Bulletin 726 High Voltage Squirrel Cage Motor Starter—Full Voltage Type—Automatic Operation



Bulletin 646 Low Voltage Squirrel Cage Motor Starter—Autotransformer Type—Manual Operation

# Starters for Large High and Low Voltage Motors

The high quality of design and construction, which has made the Allen-Bradley line of leader among motor starters, is built into Allen-Bradley starters for big motors, too.

These big starters can be supplied with all standard accessories, such as contactors for controlling auxiliary equipment, meters and instruments, current limiting fuses, etc. At maximum rating, these starters have an interrupting capacity of 10 times motor full load current.

Standard features of A-B synchronous starters include polarized field frequency relay, automatic resynchronization, thermal overload relays, out-of-step relay, and undervoltage protection. Reduced voltage starting is available either with resistor or autotransformer control.

Standard features of the big A-B squirrel cage motor starters include overload relays. Current limiting fuses are recommended for all high voltage starters.

ALLEN-BRADLEY
QUALITY

MOTOR CONTROL

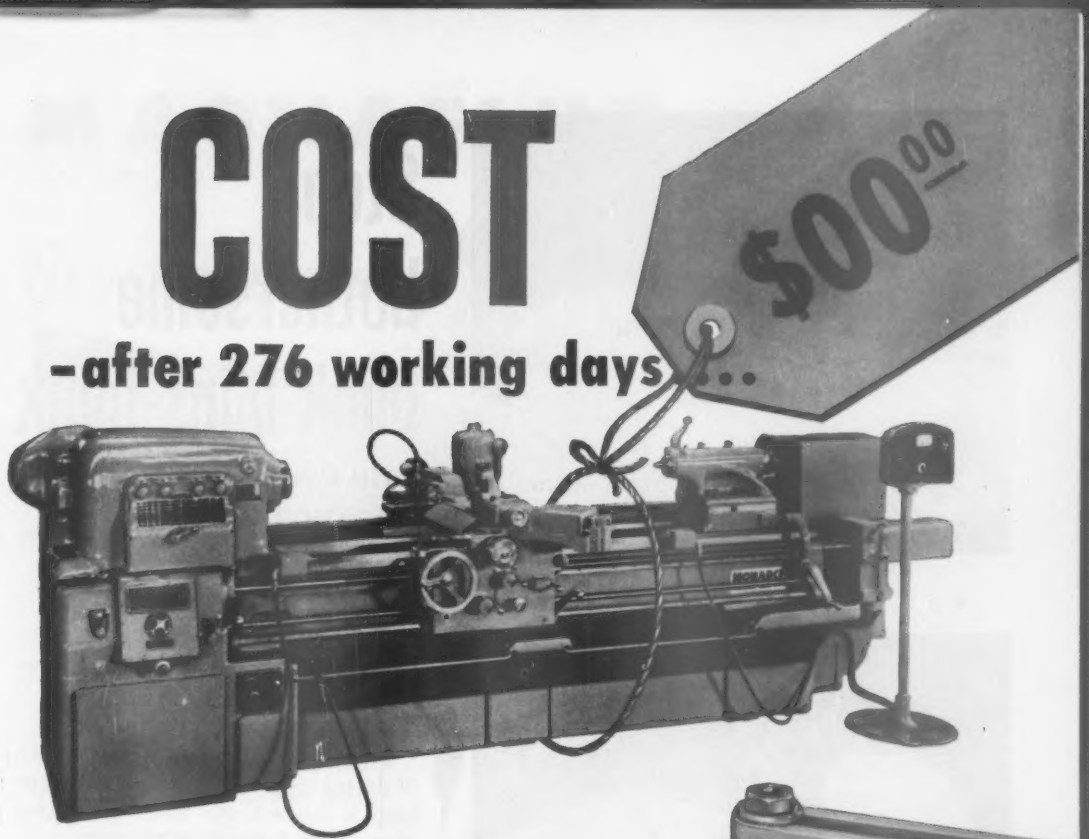
A-B
Quality

Allen-Bradley Company
1316 S. Second Street
Milwaukee 4, Wis.

B-622-A1

# COST

## -after 276 working days...



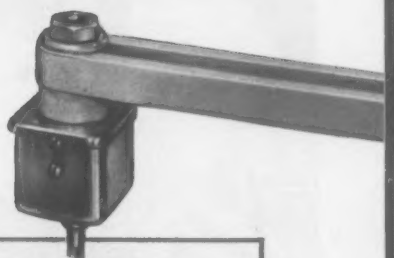

### IT WROTE OFF ITS COST IN 10½ MONTHS!

This report comes from a well-known machine tool manufacturer (not us!). We can show you many similar ones from all kinds of plants. They all add up to one incontrovertible fact—Monarch Air-Gage Tracer controlled, fully automatic turning, with its single running tool, delivers output at top efficiency. Why not? Look how many ways it saves! In turning time. In setup time. In tooling time and costs. In subsequent grinding. It's true of short runs as well as long ones.

The Monarch Air-Gage Tracer is known everywhere for its superb accuracy of duplication. The swiveling type used here adds to this accuracy an amazing versatility. Apply it to our 20 x 72 Series 60 Lathe and add the Autocycle Control as above, and you have the shop man's dream come true—the ultimate in versatility *plus* fully automatic operation.

This manufacturer, after only brief experience with his Series 60, quickly added a 20 x 168 Model M Heavy Duty Lathe with similar equipment. Together, using round templates, these machines are delivering automatic output of over 600 jobs!

The Air-Gage Tracer is right! Its performance is right! Why don't *you* write—for complete information? Request Booklet #2606 and mention your specific requirements. . . . *The Monarch Machine Tool Company, Sidney, Ohio.*



### HERE'S HOW!

. . . And by the user's own figures! This lathe was bought to turn 20 to 25 jobs. It proved so versatile that, with the larger Model M, it's now turning 600. Time savings vary from job to job, but here's a sample. One difficult work piece used to require 3½ hours' turning. It's turned now—in lots of 24—in 10 min. per piece. Each *lot* in only slightly more time than it used to take for each *piece!*

**Monarch**
TURNING MACHINES
ACCURACY • ECONOMY • LONG LIFE

• • • • • FOR A GOOD TURN FASTER • • • • • TURN TO MONARCH • • • • •

# Stop bothersome blink-blink-blink

## WITH WATCH DOG NO-BLINK FLUORESCENT STARTERS

- Watch Dog* starters *stop blinking* by automatically turning off a failing fluorescent lamp.
- Watch Dog starters *keep the lamp off* until the red reset button is pushed when new lamp is installed. No recurring blinking every time lights are turned on.
- Watch Dog no-blink starters *outlast* ordinary starters by as much as 10 to 1. With Watch Dog starters, ballasts last longer, too.

*Registered Trade-mark General Electric Company

You can stop blinking of worn-out fluorescent lamps—cut starter replacement costs—cut ballast replacement costs—by seeing that *all* your fluorescent fixtures are equipped with General Electric Watch Dog no-blink starters.

Specify Watch Dog Starters for new fixtures—insist on them for replacement. More than 40 million sold to date. Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

*You can put your confidence in—*

**GENERAL ELECTRIC**

**For all replacement needs —use the famous Watch Dog no-blink starter with the red reset button.**

**And here is the tag to look for when you buy fluorescent fixtures. It is your guarantee that the fixture has been equipped with G-E Watch Dog no-blink starters.**

# MAGNAFLUX

THE PIONEER IN NON DESTRUCTIVE TESTING

## Now Announces Spotcheck

a simple
SPRAY-ON
DYE PENETRANT
inspection

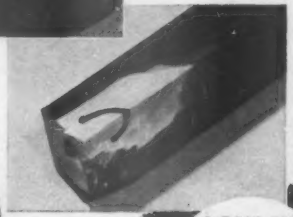
**END GUESSWORK ARGUMENTS!**
***Use it to Locate and Mark Defects Open to the Surface in Metals—Carbides—Plastics —Ceramics—Practically any Non-Porous Solid***

Spotcheck is a new, *lowest cost* inspection tool for use where remote location, small surface areas, limited volume or the cost of disassembling equipment makes use of fixed inspection equipment impractical. The complete kit is as easy to carry as a dinner pail!

A new member of the world's best known Magnaflux family of inspection methods, Spotcheck finds and indicates cracks, porosity, laps, seams, etc., clearly and unmistakably. It takes the guesswork out of countless sampling inspection jobs.

Used for *maintenance inspection*, local and routine Spotcheck tests will help you to prevent costly on-the-job failure of production machines. SPOTCHECK IS IDEAL FOR INSPECTION OF CARBIDE TOOLS AND OTHER TOOL CRIB USE!

**Spotcheck crack indication revealed in inspection of local area of punch press frame.**



**How Spotcheck shows up non-visible crack in carbide tool. Correct grinding! Avoid failure after set-up!**

**SPOTCHECK INDICATIONS**

**Complete Spotcheck Kit No. S**
8 12-oz. cans; 4 of Cle
2 each of Penetrant and D
veloper, together with carry
ing case, plus instructions
and accessories.

**LOW IN FIRST COST**
**$35.00**
plus $1.00 packing and shipping

**MAGNAFLUX CORPORATION**
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*Export Distributor:* Curtiss Wright Corp.
*In Canada:* Williams & Wilson, Ltd.

**MAIL NOW**

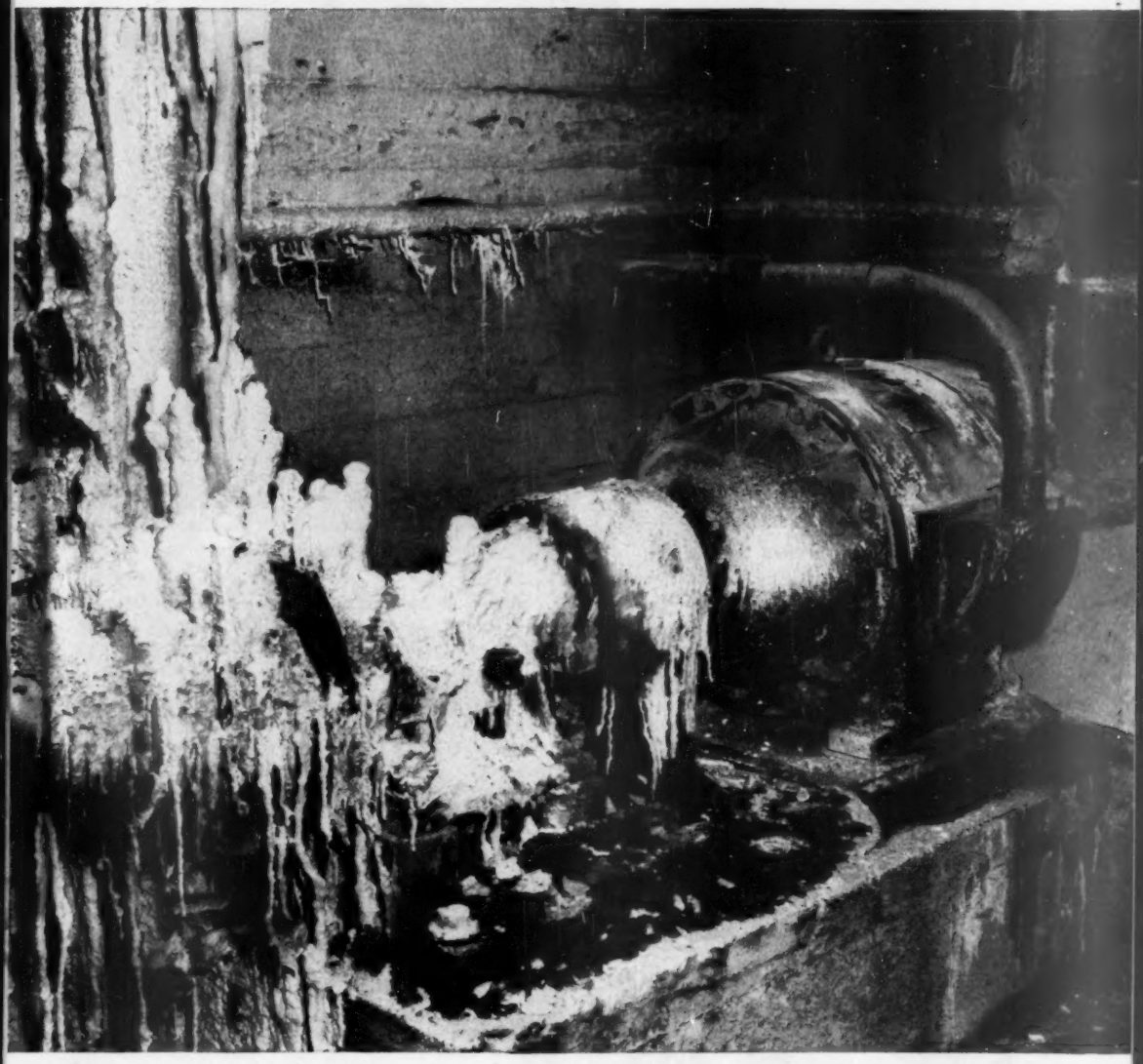
**MAGNAFLUX CORPORATION**
5944 Northwest Highway • Chicago 31, Illinois

Please send Type SK-1 SPOTCHECK KITS @ $35.00 each, plus $1.00 each, packing and shipping cost.

☐ CHECK ENCLOSED. Amount: $.....
☐ Send, on our P. O. Number .....
☐ Send only FREE illustrated Bulletin, now ...

Name ..... Title .....
Company .....
Address .....
City ..... Zone ... State .....

# WHEN JOBS ARE TOUGH



**CORROSIVE ATMOSPHERE** doesn't bother this standard, "off-the-shelf" Tri-Clad motor. Totally enclosed, fan cooled, it runs 12 hours a day, six days a week, driving a flash cooler pump under tough conditions in a chemical plant.

**GENERAL ELECTRIC**

# INDUSTRY DEPENDS ON G-E TRI-CLAD MOTORS

REG. U.S. PAT. OFF.

Here are three typical tough jobs being done safely, economically, and without interruption, by G-E Tri-Clad motors. They help show why more than 10,000,000 horsepower of G-E Tri-Clad motors are serving American industry today.

### WIDEST VARIETY

With the widest selection of standard motors obtainable anywhere, the Tri-Clad motor line offers ratings up to 2000 hp; all types of enclosures; gear motors, brake motors, and adjustable-speed drives—plus many other mechanical and electrical modifications to meet your requirements.

### TRIPLE PROTECTION

You get triple protection with *every* Tri-Clad motor—against physical damage, electrical breakdown, and operating wear and tear. Completely enclosed bearings last longer because they can be relubricated if necessary—and *without shutdown!* For specific product information, use the coupon below, or contact your nearby G-E Apparatus Sales Office, authorized G-E Agent or Distributor.

### IMMEDIATE DELIVERY

Most standard G-E Tri-Clad motors are available immediately from stock. And the most complete sales and service network in the motor industry assures you prompt service by trained specialist and application engineers, for all your motor problems. General Electric Co., Schenectady 5, New York. 752-16

**EXPLOSIVE ATMOSPHERE** dangers are avoided by using standard explosion-proof Tri-Clad motors, such as these gear-motors driving water and hydrocarbon pumps in an oil refinery.

**OIL, MOISTURE, ABRASIVE DUST** can't stop this totally-enclosed Tri-Clad motor, operating below the strip in a cold strip steel mill. Motor is completely protected inside and out.

**PROGRESSIVE MECHANIZATION . . .**

a new G-E MORE POWER TO AMERICA program—motion picture and manual—case histories of the latest mechanization trends.

Send for literature.

Section G 752-16
General Electric Co., Schenectady 5, N. Y.

Please send me the following on Progressive Mechanization:

☐ Free copy of the Progressive Mechanization Manual (GEA-5789)

Please send the following product bulletins:

☐ GEA-3580 (Open Dripproof Motors)

☐ GEA-4400 (Totally Enclosed Motors)

Name.....

Firm.....

Address.....

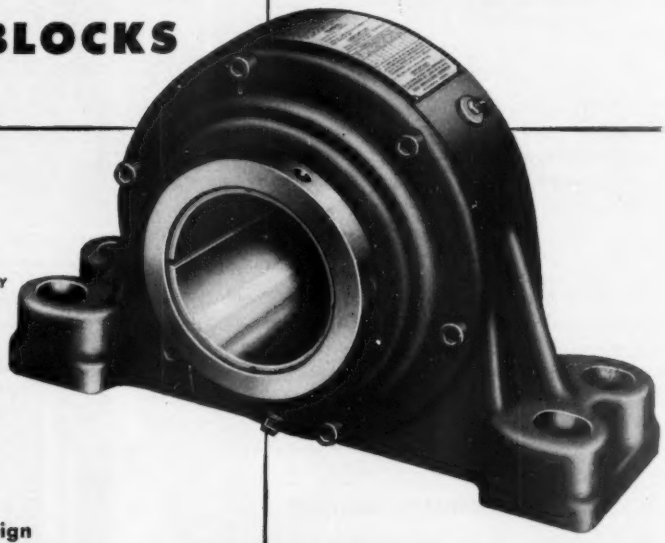
City.....Zone.....State.....

**NEW**

# DODGE-TIMKEN ALL-STEEL PILLOW BLOCKS

**HEAVY DUTY CAPACITY!**

**LESS SPACE! LESS WEIGHT!**



*A JOINT ENGINEERING DEVELOPMENT BY DODGE AND THE TIMKEN ROLLER BEARING COMPANY*

- All-Steel construction
- A new Timken bearing design
- High radial and thrust capacities
- Compact—minimum dimensions
- Minimum weight with maximum strength
- Fully self-aligning with spherical outer race
- Both expansion and non-expansion types
- Adapter mounting, proven through the years
- Double piston ring seals
- Sealed both on and off the shaft
- Fully assembled, permanently adjusted, lubricated and sealed at the factory

Here are the bearings for industry's toughest jobs. High radial and thrust capacities. Stamina to take heavy shock loads. And all-steel construction packs this load-carrying capacity into less weight and less space. Engineers are already specifying "Dodge-Timken All-Steel" for some of America's largest projects. Write for details and delivery dates, or call your Dodge Distributor.

**DODGE MANUFACTURING CORPORATION**
400 Union Street, Mishawaka, Indiana

**CALL THE TRANSMISSIONEER**
your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new cost-saving methods. Look for his name under "Power Transmission Equipment" in your classified phone book.

**DODGE**
*of Mishawaka, Ind.*

NAMES PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY,
CHICAGO THRIFT-ETCHING CORPORATION, 1555 SHEFFIELD AVENUE, CHICAGO 22, ILLINOIS

# STOP RUST! with RUST-OLEUM

See Rust-Oleum Demonstrated Booth 1237 Plant Maintenance Show Cleveland, Ohio

**BEAUTIFY AS YOU PROTECT—ALL COLORS, ALUMINUM AND WHITE!**

**RUST-OLEUM** may be applied directly over *rusted surfaces without removing all the rust!* Just remove rust scale and loose particles with wire brush and sharp scrapers . . . then apply by brush, dip, or spray. Costly sandblasting and chemical pre-cleaning are not usually required. Easy as that to cut your maintenance costs. Specify **RUST-OLEUM** to your painting contractor or architect for *every rustable* metal surface! Prompt delivery from Industrial Distributor stocks in principal cities.

**RUST-OLEUM CORPORATION**
2452 Oakton Street • Evanston, Illinois

RUST-OLEUM STOPS RUST!

**FREE SURVEY:** A **RUST-OLEUM** specialist will gladly survey your rust problems. He'll make specific tests and recommendations. No cost or obligation. See Sweets for complete catalog and nearest **RUST-OLEUM** distributor, or write for literature on your company letterhead.

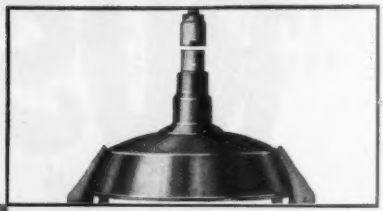
Stopping Rust with **RUST-OLEUM** 769 D. P. Red Primer

**CLIP THIS TO YOUR LETTERHEAD**
**MAIL TO: RUST-OLEUM CORPORATION**
2452 Oakton Street • Evanston, Illinois

- ☐ Have a Qualified Representative Call
- ☐ Full Details on Free Survey
- ☐ Complete Literature
- ☐ Nearest RUST-OLEUM Source

Look for this label — be sure it's genuine RUST-OLEUM

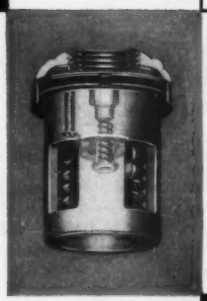
# Why it pays to buy Miller-Ivanhoe industrial incandescent lighting equipment



**VAPOR-TIGHT UNITS**—Quality built cast aluminum bodies to stand up under severe service conditions in locations exposed to moisture or non-combustible dust or vapor. Will not rust or streak buildings.

**HIGH BAY UNIT**—Extremely high efficiency. Ventilated socket provides chimney effect to draw off dirt and dust . . . reduces maintenance.

**VENTILATED SOCKET**—Miller engineered with ventilated body to dissipate heat encountered with high wattage lamps—cupped lamp contact—no "Freezing" of lamp bases. Shock absorbing mechanism protects lamp filament from vibration and impact—lengthens lamp life.

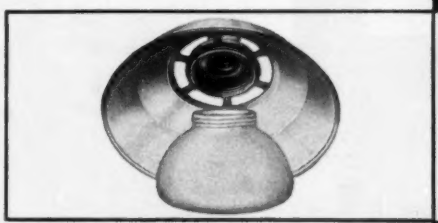


**DISCONNECTING DEVICE**—makes possible the removing of entire lighting unit, including lamp without disturbing wiring. Simplifies relamping and cleaning. Real savings in maintenance.

Nation-wide acceptance is the best evidence that Miller-Ivanhoe Industrial Incandescent Luminaires give superior lighting results and good value for money invested. How? Basically, because they are QUALITY Luminaires. Built into them, under rigid QUALITY CONTROL, are engineered features, proven over 108 years' experience pioneering in GOOD LIGHTING . . . to be the best adapted to meet the varying lighting requirements of industry.

A complete, flexible line of reflectors and fittings—of rugged construction, certified materials, and long-life finishes—designed for simplified installation and low maintenance—for L. O. C. (low overall cost).

**STANDARD SHALLOW DOME**—Broad light distribution for loading platforms, storage spaces and similar locations. Miller Quality Controlled porcelain enamel finish.



**GLASSTEEL DIFFUSER**—a lighting unit of superior quality. Inner diffusing globe encloses lamp—reduces glare and softens shadows. Perforated reflector top directs some light upward—less ceiling contrast.

**WRITE FOR MILLER INDUSTRIAL INCANDESCENT CATALOG 1-A**

**COMPLETE LIGHTING SERVICE!** MILLER, Leaders in Lighting since 1844, has a complete line of Fluorescent, Incandescent, and Mercury Luminaires, covering a wide range of industrial and commercial requirements. Readily obtainable through MILLER'S nation-wide conveniently-located distributors.

THE miller COMPANY
SINCE 1844
meriden, conn.

# . . . when you need a Compact Drive

. . . look for the Fairbanks-Morse Seal. On slow-speed applications, for example, you'll find the unique F-M Motorgear that combines reduction gears with the 40%-Shorter Axial Air Gap Motor to make a complete slow-speed unit—*more compact than the average motor alone!*

Whatever the drive problem on your equipment, the Fairbanks-Morse Seal is your assurance of top performance, minimized servicing . . . symmetrical design that improves appearance of the driven unit.

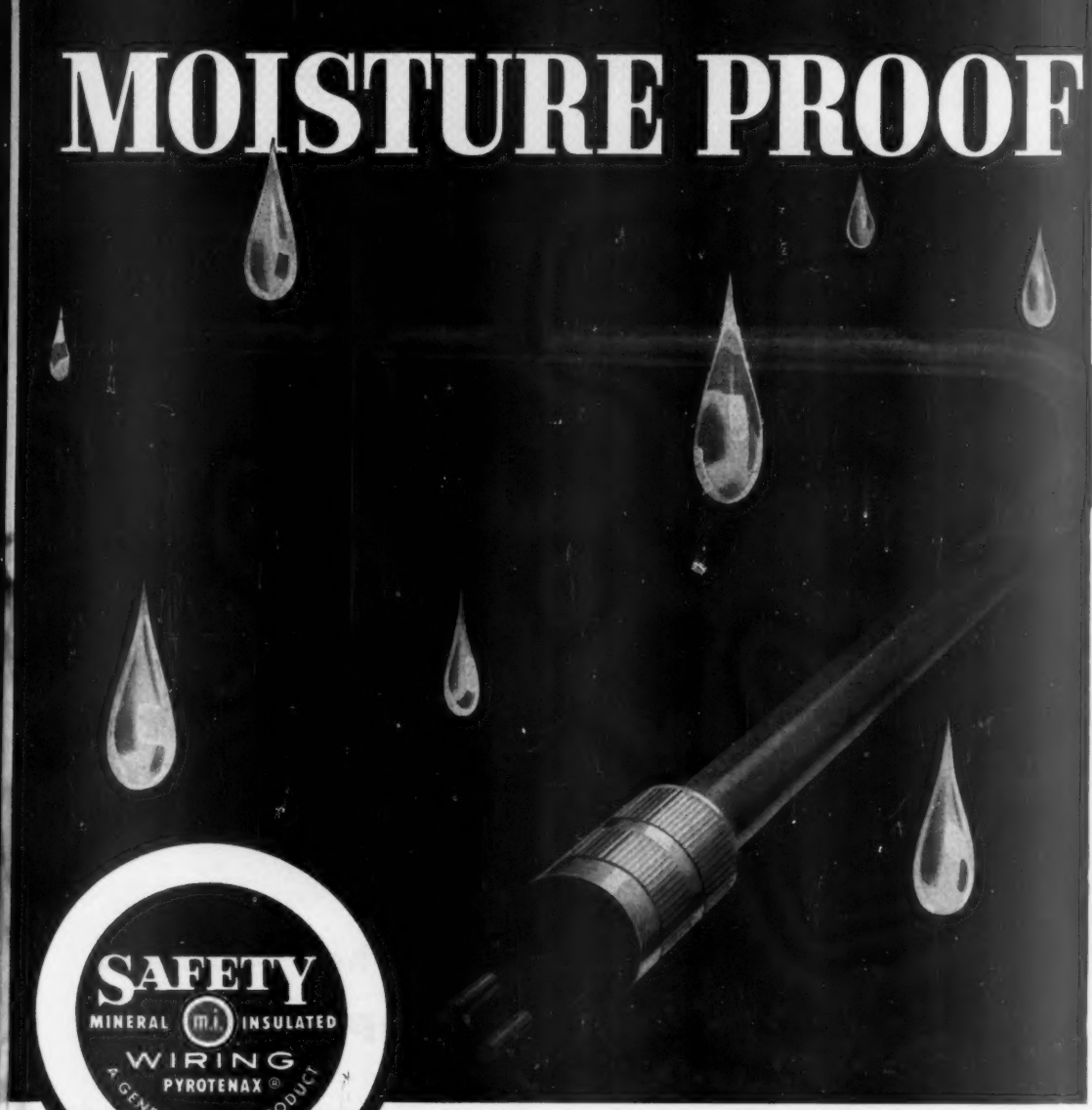
When you look for motors—one or a thousand . . . for standard or unusual applications—*always* look for the Fairbanks-Morse Seal. For over 120 years that seal has stood for the finest in manufacturing integrity to *all* industry. Fairbanks, Morse & Co., Chicago 5, Ill.

**FAIRBANKS-MORSE**

*a name worth remembering when you want the best*

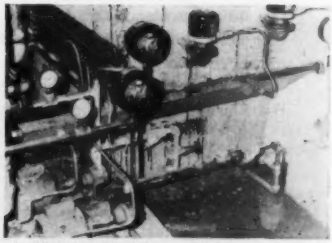
ELECTRIC MOTORS AND GENERATORS • DIESEL LOCOMOTIVES AND ENGINES • PUMPS
SCALES • HOME WATER SERVICE EQUIPMENT • RAIL CARS • FARM MACHINERY • MAGNETOS

# MOISTURE PROOF



SAFETY
MINERAL m.i. INSULATED
WIRING
PYROTENAX ®
A GENERAL CABLE PRODUCT

SAFETY m.i. WIRING* is available with fittings to connect to standard boxes and equipment.



Being completely moisture-proof, Safety m.i. Wiring is ideal for installations in moisture-filled meat packing houses (shown left), and refrigeration plants.

*Exclusively a General Cable Product*

# SAFETY m.i. WIRING

## is completely impervious to moisture, oils, most acids and alkalies . . . and is unaffected by extremes of heat or cold

Sealed within a continuous copper sheath, the insulation of a Safety m.i. Wiring System affords complete immunity from deterioration in dielectric properties normally caused by the presence of gases, water, oil, solvents or accumulated condensation in confined spaces.

Self-protected, Safety m.i. Wiring offers important advantages beyond this sealed-in imperviousness—particularly in circuits where absolute protection from interruption is essential.

Briefly outlined here, these advantages will prove well worth your closer examination. Write today for our new brochure, "20 Questions & 20 Answers on Safety m.i. Wiring System".

OUTLASTS STRUCTURE IN WHICH INSTALLED!

ONE-STEP INSTALLATION!

NO VAPOR PASSAGE!

COMPLETELY MOISTURE-PROOF!

RIGID YET FLEXIBLE!

NO HEAT DETERIORATION!

# GENERAL CABLE
## CORPORATION

EXECUTIVE OFFICES: 420 LEXINGTON AVENUE, NEW YORK 17, SALES OFFICES IN PRINCIPAL CITIES OF THE UNITED STATES

*"More Power to You"*

GENERAL CABLE GENERAL CABLE GENERAL CABLE

*A JOY Axivane Fan in a commercial store—chosen for its low noise level, compactness, and simple and easy installation.*

# The JOY AXIVANE® FAN

## Mounts Right in the Air Duct—

## Saves space, installation costs, gives you quieter, more efficient ventilation!

Write for Bulletins, or

*Consult a Joy Engineer*

**JOY MANUFACTURING COMPANY**

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

# Do their sandwiches put you in the middle?

*HOT TURKEY SANDWICH rates high on the menus at General Motors Corp., New Departure Division, Meriden, Conn., where Crotty Food Service has been keeping everybody happy for more than 10 years. Another example of how Crotty plans menus for local tastes and budgets.*

You're always in the middle where your employees' food is concerned. *Poor* food service causes gripes. *No* food service causes inefficiency. Both cause the *hidden costs* of low morale and slow production.

When Crotty moves in, hidden costs move out. Experts, backed by 21 years' leadership in employee feeding, take over full responsibility, consistent with your company policy. You get the system that's best for you. Or your present installation wins new satisfaction. All *at lowest possible cost* to you and your employees.

WRITE FOR BOOKLET, "Employee Feeding Methods" and Operating Checklist. CROTTY BROTHERS, INC., 137 Newbury St., Boston 16, Mass. Operating in 16 States and 45 Cities.

**CROTTY**
BROTHERS, INC.

*SINCE 1930...THE FOOD SERVICE MANAGEMENT THAT*

## keeps everybody happy

# You can't help a worker

## (The problem of off-the-job accidents)

## AMERICAN MUTUAL

*Service from salaried representatives in 78 offices!*
*Savings from regular substantial dividends!*

**GROUP ACCIDENT AND HEALTH-HOSPITALIZATION . . . . WORKMENS**

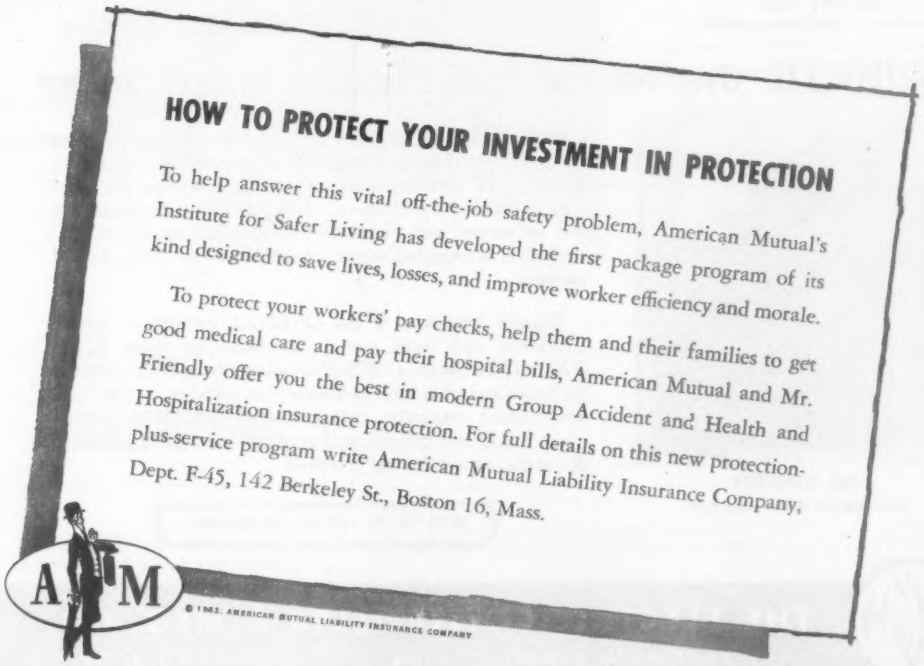
# take a Bath!

## By Mr. Friendly

A worker slips in a tub . . . and crash!
He's out for weeks and you're out *cash.*
But what can you do? You cry in wrath,
*You can't help a man take a shower or bath!*

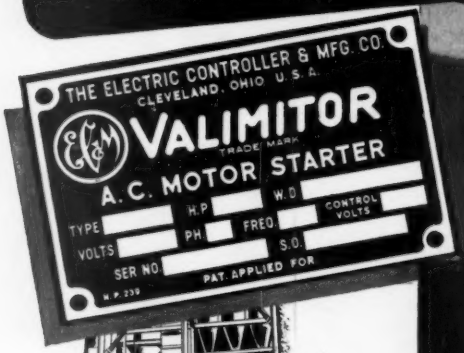
You can't keep him wrapped in cotton . . . alas,
You can't keep a good man under glass.
And how many workers do you meet
*Who want their hands held 'cross the street?*

How can you cut down off-the-job losses?
We have a program for workers 'n bosses . . .


HOW TO PROTECT YOUR INVESTMENT IN PROTECTION
To help answer this vital off-the-job safety problem, American Mutual's Institute for Safer Living has developed the first package program of its kind designed to save lives, losses, and improve worker efficiency and morale.
To protect your workers' pay checks, help them and their families to get good medical care and pay their hospital bills, American Mutual and Mr. Friendly offer you the best in modern Group Accident and Health and Hospitalization insurance protection. For full details on this new protection-plus-service program write American Mutual Liability Insurance Company, Dept. F-45, 142 Berkeley St., Boston 16, Mass.
A M
© 1952. AMERICAN MUTUAL LIABILITY INSURANCE COMPANY

**COMPENSATION . . . . AUTOMOBILE . . . . ALL FORMS LIABILITY INSURANCE**

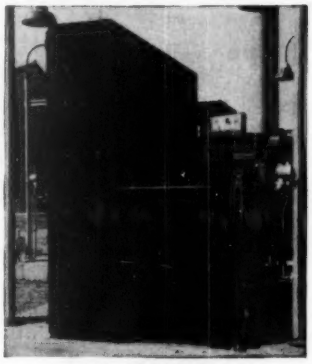
# A GOOD BUY for Outdoor Installations



**CEMENT MILL**
Installation in Eastern Pennsylvania.

## Save Housing Costs— Production Space

## COMPLETE Overload and Fault Protection in each Starter



**OIL REFINERY**
Installation in Northwestern Ohio.

EC&M VALIMITOR Starters for 2300-4600 volt motors are built in corrosion-resistant, drip-proof enclosures to supply their own protection against the weather-elements when mounted out-of-doors. Expensive control rooms are not necessary and installation is speeded by the totally-enclosed, completed-wired construction of these EC&M starters.

Equally important is the OVERALL protection against overloads and short circuits provided by these EC&M VALIMITOR Starters. EC&M Overload Relays trip instantly on faults and give inverse-time trip on overloads. The high interrupting capacity contactor and VALIMITOR coils clear the circuit quickly and safely. Fuses and spare units for replacement are not required.

**Write for T9-117 Reprint Bulletin**

**THE ELECTRIC CONTROLLER & MFG. CO.**
2698 EAST 79TH STREET ★ CLEVELAND 4, OHIO

Operator confidence soars—and so does production—with the Schrader Press Control. For this control is definitely a two-hand device. It is designed so that the hands that feed the die must also operate the press. Both hands must be used simultaneously for each operation of the press and cannot stray into the danger zone when the ram comes down.

This *increased safety* of Schrader's Press Control lets operators build a worry-free rhythm that puts new speed in your presses in just a short time.

What's more, Schrader Controls end the fatigue common with mechanical foot pedal operation—a Schrader-

# Reduce Danger Here

equipped press can be run as easily as an ordinary typewriter.

Wherever you have a power press—or any machine with a mechanical clutch—there's a chance to increase safety . . . boost operator confidence and thus increase production with a Schrader Control.

Let us help you decide what will best fit your needs. Write, describing the machines you plan to equip—or fill out the coupon below.

**Schrader**
REG. U. S. PAT. OFF.

**products**
**control the air**

Air Cylinders • Operating Valves • Press & Shear Controls • Air Ejection Sets • Blow Guns • Air Line Couplers • Air Hose & Fittings • Hose Reels • Pressure Regulators & Oilers • Air Strainers • Hydraulic Gauges • Uniflare Tube Fittings

**Mail This Coupon Today**

**A. SCHRADER'S SON**
*Division of Scovill Manufacturing Company, Incorporated*
**457 Vanderbilt Avenue, Brooklyn 38, N. Y., Dept. N-2**

I am interested in more information on.....

Name_____ Title_____

Company_____

Address_____

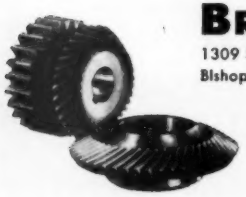
NEW heat-treating
No guesswork in Brad Foote's modern, completely new heat-treating department. Note control panels with recording instruments.

**Heat-Treating** of gears is a science. It can bring out the ultimate of service life offered by quality alloys. Good heat-treating is dependent upon knowledge of heat-treating processes and skill in using fine heat-treating equipment.

• Illustrated above is part of BRAD FOOTE'S new $500,000 heat-treating department with modern equipment that removes the element of chance from a sometimes fallible job. Precise control equipment assures exact temperatures and timing—which means unvarying conformity to hardness specifications.

• The best in heat-treating at BRAD FOOTE is but another step in our complete control of the quality of every BRAD FOOTE gear, gearmotor, reducer, and transmission. It is your guarantee that you'll get satisfactory service if you use the gears yourself or build them into your equipment for use by others. No one shares our responsibility.

• We'd like to discuss your gear requirements.



## BRAD FOOTE GEAR WORKS, INC.

1309 South Cicero Avenue • Cicero 50, Illinois
Bishop 2-1070 • OLympic 2-7700

**subsidiaries**

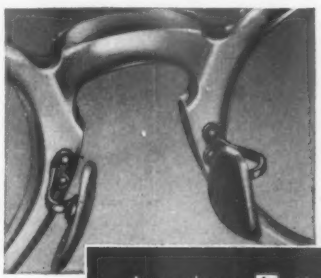
AMERICAN GEAR & MFG. CO. • Phone: Lemont 920 • Lemont, Illinois

PITTSBURGH GEAR COMPANY • Phone: ATlantic 1-9950 • Pittsburgh 22, Pennsylvania

## The Worker's Nose Knows!

# Adjustable Nose Pads of **AO FX9200 GOGGLE** Make it Easy to Fit the Hard to Fit

Now with the new AO FX9200 goggle, the hard-to-fit worker can enjoy the safety, unobstructed vision and lightweight comfort which the AO FX9200 series goggle provides. Non-corrosive nose pads of thin cellulose acetate adjust for perfect fit easily . . . and they are removable for quick replacement just as easily. "Rocking" nose pad construction distributes goggle weight broadly for pressure-free comfort. The FX9200 is particularly recommended with prescription Super Armorplate lenses, with or without side shields. Your nearest AO Safety Products Representative can supply you.



***Quick Facts***

- Hinges and temples out of line of sight for unobstructed vision
- Lenses conform to eye orbit for better vision and looks
- Comfort cable or skull temples
- Side shields of perforated acetate to prevent lens fogging
- Keyhole bridge for extra protection and snug fit

*AO's Industrial Vision Program Increases Production, Decreases Accidents. Write today for booklet "Improved Industrial Vision" to 61 Vision Park, Southbridge, Mass.*

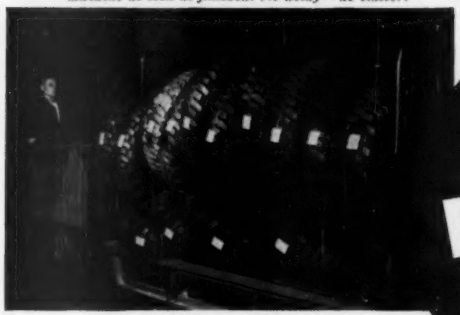
**Register and Vote!**

American Optical
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

*Truck synchronizes flow of materials to match production. Here tire treads are carried from treading machine as soon as finished. No delay—no clutter.*

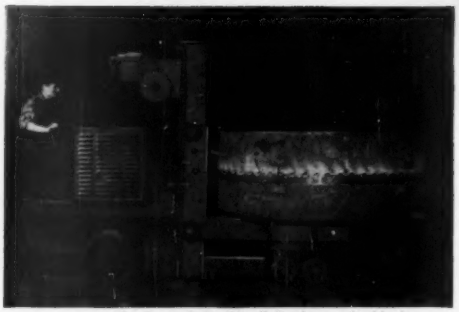
*Square feet become cubic feet when this E-P fork truck triple tiers drums four to a pallet.*



*"King size" load of tires transported by E-P low lift truck on special skid.*

# ELWELL-PARKER *Trucks*

## do all these jobs for one user



*Goodyear finds Elwell-Parkers valuable in their maintenance dept., too. Here a heavy truck tire mold is moved in the machine shop.*

*High stacking huge tires—Elwell-Parker ease of control pays off on a job like this.*

The versatility of Elwell-Parkers is well illustrated by these typical applications at the Akron plant of Goodyear Tire & Rubber Co. All over this huge factory Elwell-Parkers are constantly on the go in production, storage, distribution and maintenance . . . Without obligation an experienced E-P man will gladly survey your plant—to uncover new cost-cutting applications for industrial trucks. The Elwell-Parker Electric Co., 4025 St. Clair Avenue, Cleveland 3, Ohio.

***NEW General Catalog*** describes all E-P trucks in detail. Write for your copy *NOW*.

**ELWELL-PARKER**

**POWER INDUSTRIAL TRUCKS**

*Established 1893*

# Rolling Steel DOORS

*Manually, Mechanically, or Power Operated*

MAHON CHAIN-GEAR OPERATOR

MAHON STANDARD POWER OPERATOR 920-P

The vertical, roll-up action of a rolling steel door makes it ideally suitable for use where, in many cases, no other type of door would adequately meet the requirements. Quick opening, quick closing Rolling Steel Doors occupy no usable space either inside or outside the opening . . . they create no overhead obstructions above the floor—cranes may be employed to handle materials adjacent to the door opening. All-metal construction of Rolling Steel Doors provides permanence, greater protection against intrusion and fire, and assures you a lifetime of trouble-free service. When you select a rolling steel door, it will pay you to compare the manufacturer's specifications as well as the price tags . . . you will find that the hot-dipped galvanized curtain slat material that goes into Mahon Rolling Steel Doors is chemically cleaned, phosphated, and treated with a chromic acid solution to provide paint bond, and that the protective coating of synthetic enamel is baked on at 350° F. prior to roll-forming. This is just one of the extra value features of Mahon Rolling Steel Doors. See Sweet's Files for complete information including Specifications, or write for Catalog G-53.

**THE R. C. MAHON COMPANY**

Detroit 34, Michigan • Chicago 4, Illinois • Representatives in all Principal Cities

Manufacturers of Rolling Steel Doors, Grilles, and Automatic Closing Underwriters' Labeled Rolling Steel Doors and Fire Shutters; Insulated Metal Walls and Wall Panels; Steel Deck for Roofs, Partitions, and Permanent Concrete Floor Forms.

ROLLING STEEL DOORS, SHUTTERS AND GRILLES TO MEET EVERY REQUIREMENT

# MAHON

# HEAVY LOADS AWAY!

## *one man moves up to 15 tons*

It's *100%* easy handling of heavy loads with the Trav-Lift! No out-of-reach spots, no traffic-jam delays, no rehandling . . . *this way!* Lift, transport, lower and stack materials *anywhere* within an entire bay area. It's all done through the air, all by just *one* man.

That's why, when requirements call for cranes, P&H Trav-Lifts are first choice for fast handling. In the Trav-Lift, you get a custom-made crane at "stock" prices . . . because P&H uses standard money-saving designs . . . because P&H builds the entire unit, electrical equipment included.

You can have the Trav-Lift with cage or floor control . . . with various spans and lifting speeds and in capacities to 15 tons. It's another quality product of P&H . . . America's largest builder of overhead handling equipment. Your call to P&H will bring an expert anxious to help with your handling problems.

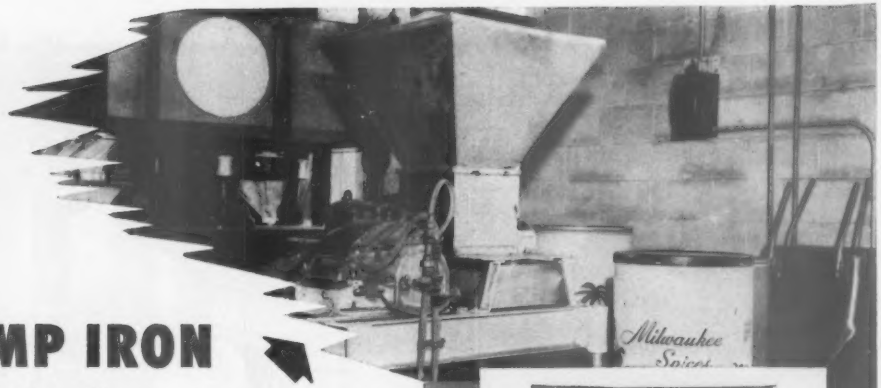
***handle it "thru-the-air" at lower cost***

P&H OVERHEAD CRANE DIVISION

**HARNISCHFEGER CORPORATION**

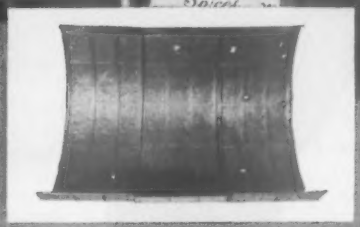
4400 West National Avenue, Milwaukee 46, Wisconsin

POWER SHOVELS • CRAWLER AND TRUCK CRANES • OVERHEAD CRANES • HOISTS • ARC WELDERS AND ELECTRODES • SOIL STABILIZERS • DIESEL ENGINES • PRE-FABRICATED HOMES



# TRAMP IRON

**hurled by a Spice Mill operating at *6800* r.p.m. . . .**



**ruined a lot of screens (approximate replacement cost — eighteen dollars) in a Milwaukee food processing plant . . .**

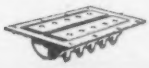
**until a DINGS PERMA®-PLATE non-electric, guaranteed permanent-MAGNET was installed at the base of the hopper that fed the mill (note nails, wire, bolt held on slide) . . .**

**This powerful magnet traps and holds tramp iron in its field until the mill is cleaned at the end of an operating cycle.**

This is one of the many ways food processors are using DINGS PERMA®-PLATE MAGNETS to protect their processing equipment — purify their products. For more information on this powerful, certified permanent magnet write for catalog C-1205-A.

**Rout tramp iron from your processing flow with a "JOB-SELECTED" MAGNET by Dings.**

PP-1



Perma®-Plate Magnet

Magnetic Pulleys

Enclosed Drum Unit

**Dings**

MAGNETIC SEPARATOR COMPANY

4768 W. ELECTRIC AVENUE, MILWAUKEE 46, WIS.

# PITT CHEM Coatings
## really lick corrosion!

THERE'S hardly a structure or piece of equipment in your plant that won't serve you *better* and *longer* if it's protected with Pitt Chem Tar Base Coatings. No other material does such a complete job of protection at so little cost.

These tough, durable coatings will withstand years of exposure to a wide variety of atmospheric and chemical conditions, above or below ground. They're easy to apply, economical to use and provide a strong, adhesive film up to 10 times as thick as ordinary paints per coat.

Pitt Chem Coatings give you better protection because they're made by a *basic* producer and *quality-controlled* from coal to finished coatings. *If you have a corrosion problem, write or call for a Pitt Chem Coating Specialist today.* He'll be glad to make recommendations without cost or obligation.

**PITT CHEM 101**
A versatile, heavy duty coating that withstands severest corrosive conditions.

**PITT CHEM 102**
A thin, high gloss maintenance coating for steel and concrete surfaces.

**PITT CHEM 103**
A heavy duty coating for metal exposed to corrosive vapors, dilute acids and alkalis.

**PITT CHEM 104**
A fast drying, high gloss coating for equipment handling potable water.

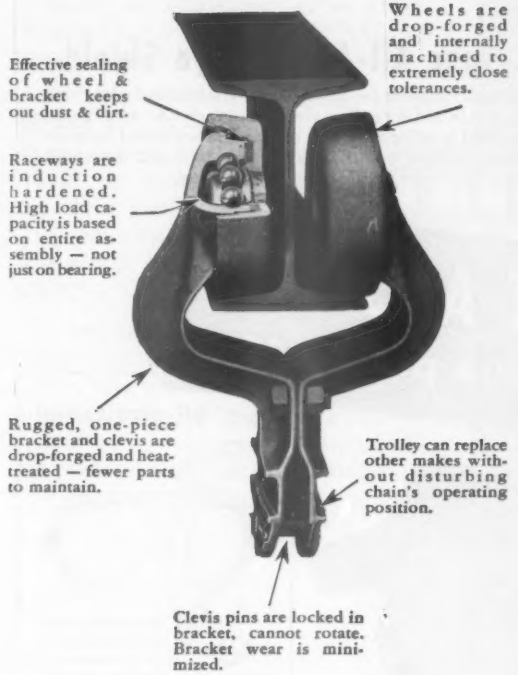
WAD 4270

**PITTSBURGH COKE & CHEMICAL CO.**

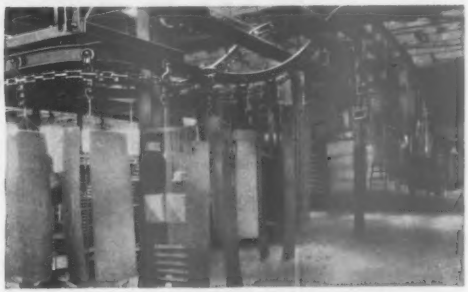
COAL CHEMICALS • AGRICULTURAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

# When you buy TROLLEY CONVEYORS why not get BOTH?

## Superior components PLUS Engineering ingenuity


Wheels are drop-forged and internally machined to extremely close tolerances.
Effective sealing of wheel & bracket keeps out dust & dirt.
Raceways are induction hardened. High load capacity is based on entire assembly — not just on bearing.
Rugged, one-piece bracket and clevis are drop-forged and heat-treated — fewer parts to maintain.
Trolley can replace other makes without disturbing chain's operating position.
Clevis pins are locked in bracket, cannot rotate. Bracket wear is minimized.

Enameled pieces are transported on a Link-Belt Overhead Trolley Conveyor through a 58-foot furnace which operates at temperatures up to 1600° F.



After leaving the bake oven, these parts for filling-station pumps are circulated on a Link-Belt Overhead Trolley Conveyor until thoroughly cooled.

You can make your overhead trolley conveyor dollars go farther by calling in Link-Belt while you're still in the planning stage. Link-Belt makes the finest trolley on the market today. Equally important, our specialists can draw on the world's largest, most varied background of conveying and power transmission application.

Bringing parts to workers and taking them away. Drawing raw materials from stock at correct intervals. Synchronizing operations to eliminate bottlenecks.

Link-Belt Overhead Trolley Conveyors do all these jobs to release valuable manpower for productive work . . . to increase output. And they free floor space, too.

Why not have a Link-Belt engineer help you and your consultants plan peak production results? Write for Book 2330 for all the facts.

**LINK-BELT**

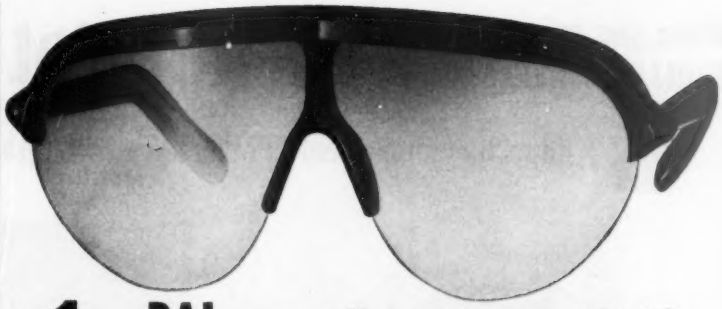
**OVERHEAD TROLLEY CONVEYORS**

LINK-BELT COMPANY: Chicago 8, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities. 12,411-B

### 1¼ oz. BAL-spec Eye Shield

One-piece snap-in lens is extra large, affords wide field of vision, is formed to 6.00D curve. All-acetate frame is non-sparking.

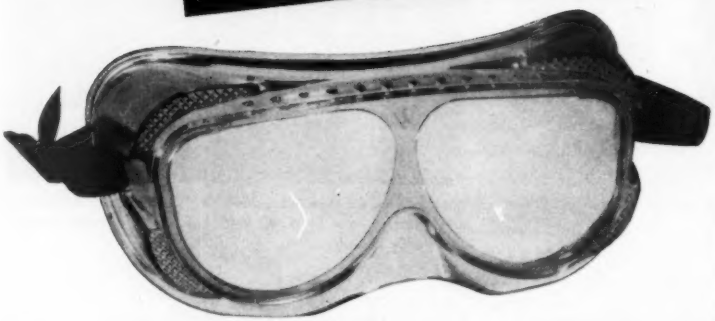
Ful-Vue temples provide unrestricted side vision, choice of flexible riding bow, or spatula which are especially liked by women because they don't muss hairdo.



## 1 BAL-spec All-Acetate Eye Shield

BAL-spec is especially suitable for supervisory personnel and plant visitors, and others who pass in and out of hazardous areas. Each BAL-spec Eye Shield is individually sealed in cellophane, may be repacked and sealed for re-use in polyethylene bags available from Bausch & Lomb. BAL-spec meets all U.S. Bureau of Standards tests for impact-resistance, of course.

# THE 2 BEST ANSWERS
## to low cost eye protection



## 2 BAL-guard All-Acetate Eye Shield

Here is side and frontal protection without restriction to field of vision. BAL-guard is molded to fit any average face comfortably. It may be worn over regular glasses, or corrective safety glasses. BAL-guard meets all U.S. Bureau of Standards requirements for protection against impact, guards against dust or splash. Frame available in 2 shapes—wide and narrow—in clear, transparent green or opaque brown. Snap-in lens in clear or transparent green.

### 1¾ oz. BAL-guard Coverall

BAL-guard's unique 2-way ventilation insures a minimum of fogging. Roll-molded rims for extra comfort, extra structural support.

Crystal-clear snap-in lens is replaced in seconds. Lens area fits orbital cavity, is ideally shaped for full visual comfort.

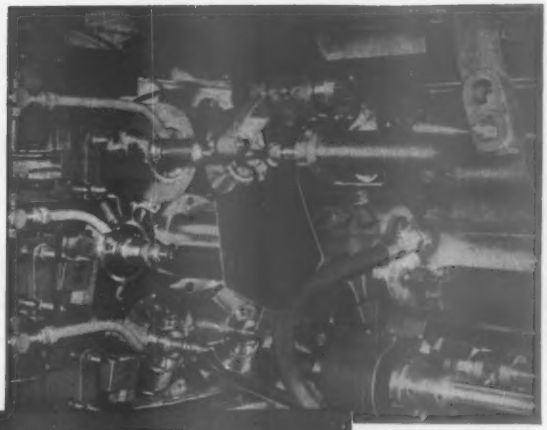
BAUSCH & LOMB *Safety Eyewear*

***WRITE TODAY*** for complete specifications and prices on these two great acetate eye shields. Bausch & Lomb Optical Co., 90112 Smith St., Rochester 2, New York.

Case histories have appeal, whether they're about someone's time being bettered at a lathe or at an altar. Success likes success, and "misery likes company."

An "automatic's" case history is just an *end* of a *means* of machining facility. If you procure the right facilities, good case histories will result in *your* plant.

When selecting the best multi-spindle automatic facility for *your* needs, you will want to compare *all brands*. But you should have *full* information for a thorough comparison. You can have it on CONOMATICS.



*Front Side of Tooling Area 1-5/8-SIX*

# THE FACILITY BEHIND THE NEWS

*Rear Side of Tooling Area 1-5/8-SIX*

Cross drilling, cross milling, end broaching, end milling, and sawing operations are commonly performed by stopping the work spindles – often a costly procedure. For certain requirements, such as for the broached hole in the piece shown, CONOMATICS have performed all of the operations mentioned without stopping the work spindles.

*A Comparison of ALL Automatics is in favor of Cone*

**Conomatic** } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

# A "natural" for protection

## 3M® STRIPPABLE COATINGS

3M strippable coatings are designed for the protection of finished metal surfaces against mars and abrasion during fabrication. These vinyl coatings form a tough, abrasion-resistant film which protects metal thoroughly.

The coatings can be applied to blank or coil stock—before fabrication or between any stage of production—and greatly facilitate the handling of metal from manufacturer to fabricator to consumer. Your metal ends up smooth and unscratched . . . requires no *expensive repolishing!*

These low-cost, fast-drying coatings are easy to work with too. They can be applied at room temperature, using standard paint spray equipment . . . and can be stripped off or blown off when protection is no longer necessary. Strippable coatings also give you an important means of reducing "rejects."

Investigate the potential of these coatings, then take advantage of their money-saving abilities. Contact the 3M field engineer in your city, or, write directly to 3M in Detroit.

## 3M® COATING EC-968

*ONE OF 1000 BETTER ADHESIVES, COATINGS AND SEALERS*

**USES:** protects metal from scratches, mars, abrasion in various stages of storage, shipping and fabrication: protects ground, polished or plated components against abrasion and tarnishing while other parts of sub-assembly are machined: also used to protect glass or other non-porous surfaces which easily scratch or abrade.

**PROPERTIES:** a red-brown translucent film, easily sprayed on, easily stripped off by hand or with an air hose: synthetic resin base: solvent type: excellent resistance to water, gasoline, oil: protects metal stock during stamping, deep drawing or forming operation: coverage for one mil film is 200 to 225 square feet per gallon.

FOR MORE INFORMATION ON EC-968, AND FOR INFORMATIVE 32-PAGE BOOKLET ON ADHESIVES, COATINGS AND SEALERS, WRITE 3M, DEPT. 312, 411 PIQUETTE AVENUE, DETROIT 2.

3M COMPANY

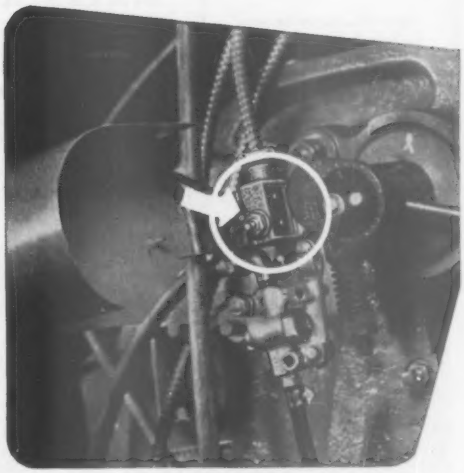
ADHESIVES • COATINGS • SEALERS

ADHESIVES AND COATINGS DIVISION • MINNESOTA MINING AND MANUFACTURING COMPANY
411 PIQUETTE AVE., DETROIT 2, MICH.
GENERAL OFFICES: ST. PAUL 6, MINN.
EXPORT AND CANADIAN SALES: 270 PARK AVE., NEW YORK 17, N. Y.

# How plant engineers make present machines safer and more automatic by installing MICRO PRECISION SWITCHES

Here are typical installations of MICRO precision switches by plant engineers on present plant equipment to make machines safer, more automatic and more exactly suited to their production needs.

Machines so equipped often pay big dividends in increased production. The MICRO line of precise snap-action switches for economical modernization of existing plant equipment includes a wide variety of ruggedly-housed switches for use as limits, safeties and interlocks.



**Prevents punch press from operation unless inching bar is removed**

This MICRO die-cast enclosed switch is used to protect the operator of a punch press by preventing the machine from starting when the hinged guard is opened for insertion of the inching bar, used in setting up dies. The switch is wired to the power supply ahead of the on-off switch. When guard is opened, power to machine is automatically cut off.

**Keeps screw machine shut off while operator feeds new stock**

This MICRO roller-arm-actuated die-cast enclosed switch increases operator safety and prevents damage to a screw machine. The switch is wired into the power circuit ahead of on-off switch. It automatically shuts off the machine when either the bar support tube or spindle cover is moved to an open position.

**Surface grinder won't operate unless magnetic chuck is turned on**

This MICRO sealed die-cast switch prevents damage to surface grinder or stock and increases safety of operator. Arm installed on the shaft turns on the permanent magnet chuck which holds the stock in place. Driving motors cannot be started unless chuck is turned on.

MICRO distributors are located in over a hundred key cities to supply just the right switch to meet your plant application need. Look for your nearest distributor in your classified telephone book under "Switches, Electric."

**MICRO** MAKERS OF PRECISION SWITCHES

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

FREEPORT, ILLINOIS

Panel discussions on how casters help reduce the **"Reducible 30%"***

# MATERIALS-HANDLING FORUM

Write us how you've used casters to solve specific handling problems. $25.00 will be paid for material used.

A SERIES PUBLISHED BY BASSICK, WORLD'S LARGEST MANUFACTURER OF CASTERS AND FLOOR PROTECTION EQUIPMENT

## *"Floating-Hub" outstanding engineering contribution to improved materials-handling*

"Floating-Hub", an exclusive Bassick development, brings a practical, successful principle of built-in shock absorption to wheel construction, applying mechanical resiliency between rim and axle.

## 9 Ways "Floating-Hub" smooths and simplifies materials-handling

On trucks and portable equipment "Floating-Hub" (1) absorbs shock, (2) dampens vibration, (3) eliminates bouncing action, (4) rides over obstacles, (5) rolls easier, (6) reduces noise, (7) protects loads, (8) protects floors, (9) reduces truck maintenance by lengthening the life of the truck and caster or wheel equipped with it.

### PATENTED CONSTRUCTION DIFFERS FROM ORDINARY SPRING MOUNTINGS

Unlike the usual spring-action device that merely bounces the load over a bump, Bassick's unique "Floating-Hub" snubs the bounce. It rides with the punch, backs away with the blow and at the same time starts its climb. It keeps all wheels in contact with the floor.

Thus, it is entirely different in principle and action from ordinary spring mountings.

## WIDE RANGE OF SIZES AND TYPES

Bassick's "Floating-Hub" is available in many sizes (from 6 to 16 in.) and many types (the one shown is No. S-8096R-2 . . . a high quality, double ball race caster with wheels for loads from 500 to 1000 lbs. per caster).

"Floating-Hub" running gear can double the efficiency and life of trailer trucks.

## Jet engine assembly line typical of thousands of successful installations

The ability of Bassick patented "Floating-Hub" shock absorption to protect and ease the movement of many kinds of delicate parts and products has been proved by thousands of applications – from jet engines to highly-finished auto bumpers, ceramic products, glass and china ware, loose loads of small parts.

"Floating-Hub" makes trucks and portable equipment as easy-riding as a fine automobile.

**Full details available upon request**

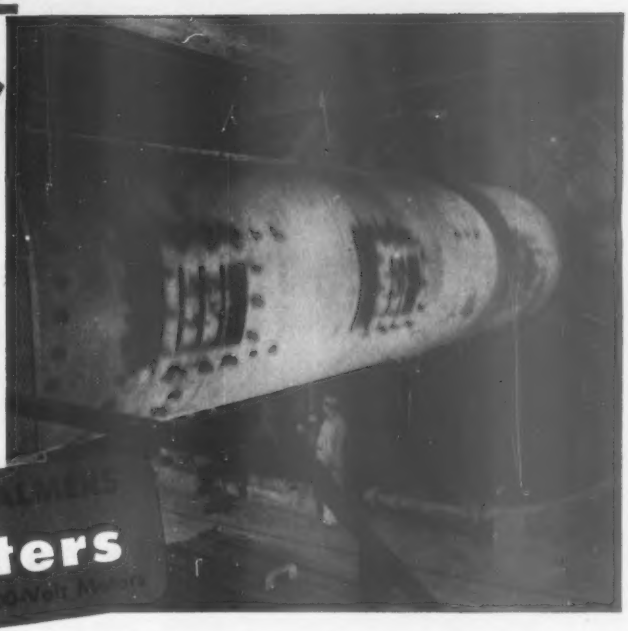
Bassick's "Floating-Hub" costs only slightly more than ordinary casters. Write for Catalog 124A. There is a local industrial distributor in your vicinity who can supply you with Bassick Casters and Wheels for every need. Factory engineering assistance readily available. THE BASSICK COMPANY, Bridgeport 2, Conn. *In Canada:* Belleville, Ont.

*According to cost analysts, materials-handling (about 30% of total cost) affords about the only real opportunities for cost reduction today.

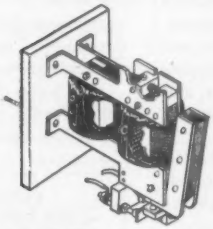
Bassick — A DIVISION OF STEWART-WARNER

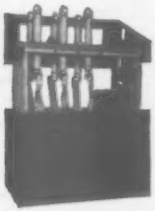
MAKING MORE KINDS OF CASTERS · MAKING CASTERS DO MORE

# CONTROL *Engineered* for the cement industry



**CEMENT MAKING** requires controlled power for dependable, continuous operation of slow speed processing machinery operating in dusty atmospheres — often under adverse voltage conditions. Finish grinding of cement clinker in this *Ballpeb* mill, for example, needs a 550-horsepower synchronous motor and a 2300-volt starter designed to give complete protection to the motor.





**ALLIS-CHALMERS** Type H starters engineered for these applications provide complete control plus protection of motors, machines and personnel. Current limiting fuses, relays, instruments . . . everything needed is built in. Heart of every synchronous starter is the Type 230 field application relay.

**DC EXCITATION** is applied by this relay at the exact half cycle when proper rotor speed is reached. It maintains excitation during normal operation . . . removes excitation on motor pull-out . . . resynchronizes motor if pull-out condition is corrected before protective devices disconnect motor from line.

**HIGH VOLTAGE** starters may have either oil-immersed or air-break primary contactors as standard. Both types are designed for ready access . . . built to give long life with low maintenance. The selection of contactors for every Allis-Chalmers controller is based strictly on job requirements.

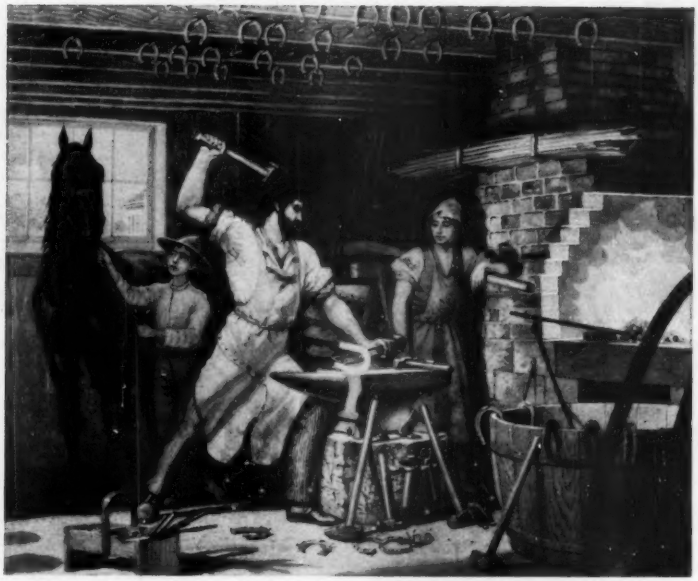
# ALLIS-CHALMERS

A-C ALLIS-CHALMERS

*Ballpeb* is an Allis-Chalmers trademark.

*There are Allis-Chalmers controllers for use in every industry . . . starters for squirrel-cage, wound-rotor and synchronous motors. For starters up to 2500 hp at 5000 volts—check with your A-C representative, or write Allis-Chalmers, Milwaukee 1, Wis., for Bulletin 14B6410A.*

A-3717



From the Beale Collection of Early Americana

# Horseshoe Iron...to Aircraft Steel

## *Ryerson Completes 110 Years of Service*

When Joseph Ryerson opened his first small iron store, 110 years ago, the clang of the blacksmith's anvil was a dominant note in America's metalworking industry. Blacksmiths, boiler makers and other metalworking pioneers were the iron store's first customers. Their orders for horseshoe and boiler iron, axles, plow steel, spikes, etc. formed the basis of our business.

Today that small iron store has grown to be the world's largest steel service organization with fifteen great plants strategically located across the nation.

On the occasion of our 110th Anniversary, we are grateful for our thousands of customers whose orders through the years testify to the Ryerson tradition of trustworthy service. And we are thankful for the privilege of living and working in a free country where initiative and service are rewarded.

From your nearby Ryerson steel plant flows every kind of steel in every shape and size to meet the needs of industry. Ryerson shipments cover everything from structural shapes and plates of carbon steel and bright sheets of stainless to high strength aircraft-quality alloys.

When you need steel, any kind, any quantity, cut to order and delivered promptly we will be pleased to have you call us.

**PRINCIPAL PRODUCTS IN STOCK**

**CARBON STEEL BARS**—Hot rolled and cold finished

**STRUCTURALS**—Channels, angles, beams, etc.

**PLATES**—Many types including Inland 4-Way Safety Plate

**SHEETS**—Hot and cold rolled, many types and coatings

**TUBING**—Seamless and welded, mechanical and boiler tubes

**ALLOYS**—Hot rolled, cold finished, heat treated. Tool steel.

**STAINLESS**—Allegheny bars, plates, sheets, tubes, etc.

**REINFORCING STEEL**—Bars and accessories, wire mesh, etc.

**BABBIT METAL**—Lead base.

**RYERTEX**—Plastic bearing.

**MACHINERY & TOOLS**—Metal fabrication

# RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI • CLEVELAND • DETROIT PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

FACTORY
MANAGEMENT and MAINTENANCE

WASHINGTON REPORT

# WHAT TO EXPECT IN 1953

## under the new Administration

Here, and on the five following pages, you'll find out what the election means in terms of the problems that must be faced and dealt with by plant operating executives.

This analysis was made by McGraw-Hill's Washington Bureau and FACTORY editors Carroll W. Boyce, national affairs, and M. J. Murphy, industrial relations.

To be sure we were bringing you the answers to the questions uppermost in your mind, we called together five plant operating executives and an industrial consultant. They told us what they and their associates wanted to know.

The men who asked us questions about what the election means to plant men were:

P. J. Hagan, Director of Industrial Relations, Parker-Kalon Company.

Ted Duncan, Production Superintendent, Tel-Autograph Company.

John H. Pratt, Vice President, Manufacturing, Pitney-Bowes, Inc.

G. H. Zimmerman, Superintendent, Hose Division, U. S. Rubber Company.

W. M. McFeely, Director Industrial Relations, Riegel Paper Corp., Riegel Textile Corp.

Phil Carroll, Industrial Consultant.

## ELECTION EFFECT . . .

**. . . ON THE BUSINESS PICTURE.** Business generally is going to put on a real prosperity parade for the new administration. That's the almost unanimous opinion of economists who watch trends for the key government bureaus.

- Inflation fears are over. Only the economists directly attached to stabilization efforts are worried any longer about a jump in prices.
- But that doesn't mean Washington expects a down-swing, either.
- Business investment plans remain high, as revealed by a special McGraw-Hill study. Manufacturing firms will spend less on plant and equipment than this year. But utilities, trade, and service industries will almost make up the slack.
- Government spending will remain high, another big push behind business.
- Republicans will cut the Truman budget, but not enough to knock the government out of its role as the No. 1 force in the economy.
- Experts figure there is enough push behind the current high level of business to make 1953 a banner year.

**. . . ON THE LABOR PICTURE.** Washington won't let labor leaders dominate government policies as they have for 20 years. But it won't be "anti-labor," either.

- Labor leaders, for their part, will be suspicious, watching for signs of bias.
- The administration will consult with labor leaders on major issues affecting workers and labor relations. But labor will be reluctant—if invited—to fill government posts. Most leaders do not want any tinge of responsibility.
- Instead, labor leaders will be critics, pushing Republicans, and Eisenhower in particular, to deliver on campaign promises to be fair, halt inflation, extend social gains, strengthen laws protecting workers, reduce taxes.
- On the whole, labor will extend the olive branch to both government and industry. But it won't be docile. It's prepared to get rough if it smells a "crack down." *That* could bring a rash of strikes and "shotgun wedding" of AFL-CIO to fight against the "common enemy."

## CONTROLS

**DEFENSE PRODUCTION ACT** expires in two stages: price and wage controls April 30, the balance of the Act on June 30.

- Some kind of control "structure" will be provided by an extension of the Act, or by a successor.
- At least limited allocation authority will be needed after June 30. It will be given.
- "Standby" controls over prices, wages, credit — probably imposed by Executive Order subject to Congressional veto—have a fair chance.

**WAGE CONTROLS** expire April 30, may be killed sooner by Executive Order. Chance of any extension is extremely remote.

- Administration is already falling apart as WSB employees resign to find jobs elsewhere. This same situation is even more acute at Salary Stabilization.
- It presents real temptation to flout rules. Just remember that penalties are retroactive, regardless of the present state of enforcement.

**MATERIALS CONTROLS** won't die June 30 even if the Defense Production Act does. It will be awkward, but the job can be done under the Selective Service Act.

- Defense planners, however, are drafting legislation for a "CMP for the military," plus authority to make specific allocations. They expect the Republican Congress to "buy" it.
- Non-military use of a few very scarce materials, like cobalt, columbian, nickel, molybdenum, will likely continue under allocation.

**PRICE CONTROL** is dying fast, may be ended by Executive Order before scheduled expiration on April 30.

- Resignation of OPS Administrator Woods opened the flood gates on steadily mounting stream of personnel resignations.
- Especially with unions now favoring end of price-wage controls, chance of Congress extending them beyond April 30 is nil.

**CMP** is due for big changes. The new "military CMP" will provide allotments only for Defense Dept. and AEC. Purpose will be more to limit military usage than to guarantee delivery, which would be uncertain on a few items.

- April 1 is likely to bring practical end of CMP for civilian producers, except for scarcer alloys and copper. But you *must* file applications with NPA for *all* of your second-quarter requirements.

**CREDIT CONTROLS** under the new administration are almost sure to be of the indirect type: manipulating interest rates on Treasury notes, changing Federal Reserve requirements. These will be used to increase or decrease availability of money for hire.

- Even if expected deflationary trend should turn inflationary, indirect controls would be given several months' trial before re-imposing direct controls of the Regulation X and W type.

## MILITARY MANPOWER

**DRAFT CALLS** will stay high — about 50,000 men a month through next year, anyway, and probably well into 1954. Men are needed to replace returning reservists and draftees who were called in 1950.

- Period of service will remain two years.
- Look for continued high calls to keep the level of forces at about 3.7-million men.

**DRAFT EXEMPTIONS** will remain tight and become harder to get. Fathers with one child will probably be drafted by 1954.

- Occupation deferments will be tougher to prove as more men come out of the service.
- Remember, a man once deferred is liable to be drafted up to age 35 instead of age 26 for non-deferred men.

**RESERVE SUMMER TRAINING** — two weeks or more — will likely be made compulsory for draftees who have completed active duty and are returned home.

- They'll be liable for two years in the ready reserves; after that they go into the standby reserves, where summer training duty is voluntary.
- Total required service of new draftees is eight years: two active duty; two to three years in ready reserves; balance in the standby reserves.

**UMT:** No new attempts to get Universal Military Training through Congress will be made while the draft act is still on the books.

- But look for active pushing for passage after 1955.

**THE WHITE HOUSE** will steer clear of the big labor disputes.

- Eisenhower will put more reliance on bargaining, strengthen federal conciliation by refusing to butt in. His view: If both sides know they can't run to the White House, they will be more inclined to get the best deal they can on their own.
- Where necessary, Eisenhower will use the Taft-Hartley 80-day injunction. If that fails, he will put the problem up to Congress.

**THE LABOR DEPARTMENT** will have a secretary more friendly to business than Tobin.

- Minimum wage and public contracts laws will no longer be administered with the purpose of unduly raising an industry's wage rates.
- But this should have little bearing on labor-management negotiations.
- Federal mediation and conciliation service will be kept independent of Labor Dept.

**LABOR MONOPOLY** problem will be debated again next year in Congress.

- But Republicans will go slow on any move to curb industry or regional bargaining. It's hard to regulate.
- Congress will watch it closely, may act if big strikes become serious problem.
- Employers who want to get out of industry-wide bargaining should find it easier to do so.

**GUARANTEED ANNUAL WAGE** is last big area unopened by unions — from now out, almost everything else is just consolidating or holding gains.

- With labor convinced of coming deflation and perhaps recession, annual wage will be more attractive than ever. But same factor makes it less likely unions would strike for such demands.

Look for much talk, few annual wage agreements. And still fewer that really mean much.

**WAGE DEMANDS** will come mostly after controls expire on April 30. CIO will try to set pattern with steel in July.

- Until summer, all you'll see is "catch-up" raises. Lagging unions will try to get all they can within WSB pattern, build from there later.
- Unions see 1953 as "last chance" before defense spending drops, brings business decline. They will try hard to make Round 8 top this year's 10¢.

**MEDIATION AND CONCILIATION** will play a larger part in settling labor disputes. Reason: In most cases, failure of conciliation will mean a strike.

- No longer will there be a "court of appeals" after conciliation . . . White House, War Labor Board, Wage Stabilization Board.
- David L. Cole, Truman's new Conciliation chief, is a Republican in New Jersey politics. Even so, he will likely be swept out.

**SCOPE OF BARGAINING** will not be expanded any further. The only area left out of bargaining now is management functions. Union efforts to cross the line have been pretty well stopped.

- There will be no retreat, however, from the subjects recently added to the bargaining package, such as pensions and health insurance.

**LONG-TERM CONTRACTS** will become more common as trend continues toward two- and five-year agreements.

- Union leaders want to hold the gains they have made in favorable Washington and business climate, figure long contracts as best way.
- Labor also sees the long agreement as a hedge against deflation and possible management attack on union security and other contract clauses protecting unions.

**CONTRACT CLAUSES** demanded by unions will vary considerably from last year.

These factors are in the background of the changes: Labor's economists see deflation ahead. Less prospect of federal intervention in disputes. Only minor "liberalization" of Taft-Hartley.

As labor sees it, that all means less leverage at the bargaining table, less chance to win strikes.

- **ESCALATOR CLAUSES.** Losing favor. Won't be asked in new contracts. On re-openers, labor will want to build a floor under escalator at present level, or junk it entirely.
- **PRODUCTIVITY CLAUSES.** Will gain favor, since productivity can go only one way — *up*. On the average, that is.
- **ARBITRATION CLAUSES.** Labor leaders will want to broaden them to take in more territory — but they won't be a striking issue.
- **PENSIONS.** Demands will be for larger pensions, adjustment for Social Security increases, optional retirement, and (if optional) earlier retirement. And unions will want bigger voice in administration and funding.

## TAFT-HARTLEY LAW

**COMPLETE OVERHAUL** is not in sight. Sen. Taft will control the amendments. The 28 he put through the Senate in 1949 have been reduced to less than a dozen.

- Pitch is to go easy, be moderate. Tighten this, relax that, balance the other thing. In spirit, purpose, objective — Taft-Hartley won't be changed.
- Hearings will be extensive, run a couple of months. Don't look for final action until summer.

**NATIONAL EMERGENCY** strike procedure — board of inquiry, 80-day injunction, last offer ballot, etc. — won't be changed. At least not right away.

- Taft says law hasn't had a fair chance under Truman, wants to give it a try under Eisenhower.
- A wave of big strikes, of course, could force Congress to revamp the law.

**ECONOMIC STRIKERS** may get a vote in a bargaining-rights election. Present rule against this is what Eisenhower had in mind when he told the AFL convention that Taft-Hartley could be used to bust unions.

- Taft feels this fear is imaginary, but favors changing the rule anyhow. He would give NLRB discretionary power to decide which strikers, if any, could vote.

**SECONDARY BOYCOTT** rules will undergo major operation.

- Taft would tighten ban so that it applies to union pressure on secondary employer as well as on his employees.
- But he would also relax it in this way: Permit employees to refuse to do work transferred from a struck plant. Another concession: Drop the rule that injunction must be sought by NLRB quickly in every secondary boycott situation.

**FEATHERBEDDING** probably won't be redefined unless the Supreme Court finds T-H does not cover musicians' standby pay and printers' bogus typesetting, both pending.

- There's a chance, too, Congress might cover featherbedding in separate legislation — as the Lea Act now bans certain recording practices.
- In any event, NLRB may redefine it as a matter of policy. Present wording in law is loose enough to cover — or not cover — almost anything.

**JURISDICTIONAL STRIKES** will continue to be handled under present rules.

- One improvement possible to speed up handling: Let NLRB name arbitrator to decide some of them.

## NLRB

**MEMBERSHIP** of the National Labor Relations Board will be increased from five to seven. This will give Eisenhower two appointments immediately. He can make one of them chairman, reducing Chairman Paul M. Herzog (who may quit) to ordinary membership.

- No important changes in NLRB policies under present law should be expected.
- Congress will let NLRB regional officers make recommendations on election petitions, allow prehearing elections.
- Basic interpretations of Taft-Hartley won't change much, either. Most of them are decided eventually by the courts, anyhow.
- But employers can expect more sympathetic treatment from NLRB. Especially in a year or so, when a majority of NLRB will be Eisenhower men. Meanwhile, present Board members can't help taking notice of the election results.

**GENERAL COUNSEL** will be replaced by an administrator who will be even more independent of the Board members.

- The administrator will serve as a prosecutor, have charge of elections as well as unfair labor practice complaints.
- As a result, the Board itself will become more of a judicial body.

**REGIONAL OFFICES** will be last to show any changes as a result of the election.

- Most personnel are protected by Civil Service. They can be expected to read the election returns but hesitate to act on them unless policy is changed by Washington.
- Better and speedier handling by field offices will come. But not until personnel become surer of themselves under the new administration — most likely a year or more before you really see it.

## TAFT-HARTLEY LAW

**CLOSED SHOP** ban may be relaxed to accommodate construction and maritime hiring practices. Senate did it this year, but House wouldn't go along.

- Main obstacle: Senate bill would have invalidated closed shop bans in a dozen states, mostly in South. Congressmen are now even more conscious of state's rights.
- For manufacturing industries, there will be no change in present ban on closed shop, curbs on union shop.

**UNION SHOP** elections will not be written back into the law.

- Now that all the "pushovers" have voted 90% and more in favor of the union shop, some employers are asking to have the "no election" amendment withdrawn. Congress won't go for it.
- Present curbs on union shop will not be changed.

**NON-COMMUNIST AFFIDAVITS** will have to be signed by employers who want to use NLRB, just like union leaders do now. Both Taft and Eisenhower favor this "equalization."

- More important, the Justice Dept. will quit pussyfooting and really go after the left-wing union leaders who sign affidavits while clinging to communism. Thus far, they've prosecuted only a few small-fry local leaders.

**DEFINITION OF FOREMEN,** as exempt from unionization under Taft-Hartley rules, may be changed.

- However, there is no chance that Sen. Moody's bill, or anything like it, restoring full bargaining rights to foremen, will pass this Congress.
- But the mere legal language used in redefining foremen could be harmful in many plants. So keep your eye peeled on this one. Don't hesitate to make your ideas known to the Senate Labor Committee — members say they will welcome them.
- Starting point for the rewording will be Taft's 1949 amendment (never passed). His proposal was to exclude from definition of "supervisor" employees who do no more than "assign" or "direct" other employees. Taft's explanation: "No worker would be exempted as a foreman unless he is actually a foreman."
- Danger in such a definition is the latitude it provides for interpretation. Industry was wary of the amendment in 1949 because of the construction an "unfriendly" NLRB might place on it. It would be folly to assume NLRB will never again proceed on an "unfriendly" interpretation.
- Key to final action will be Taft himself. But there's a good chance he won't fall back on his 1949 proposal. Remember, at that time he was making compromises with a Democratic majority.

## OTHER LABOR LAWS

**WAGES AND HOURS** under Fair Labor Standards Act will remain fixed at 75¢ minimum wage, 40-hour week. Demands for $1 or $1.25 minimum will get a hearing, but that's all.

- New Administrator will probably clarify definition of exempt personnel, help settle question of who must get overtime. But don't expect everything to happen his first day in office. It will take time.

**WALSH-HEALEY** Public Contracts Act won't be repealed, despite industry pressure.

- Nor will Congress write into the law requirement that prevailing wages be determined on a local rather than national basis.
- But you can expect the new Secretary of Labor to change the basis of determination, without any change in the law. Don't, however, expect all Walsh-Healey rates to be adjusted at once. It will take months.

**FEPC,** at least as a *compulsory* fair employment practices bill, has little chance.

- But Sen. Humphrey will push for a vote on a voluntary program. He would set up a civil rights commission, which would promote advancement in civil rights generally. His commission would have no enforcement power, work through civil, church, educational groups on a local level.

**SOCIAL SECURITY** will not be changed this year, despite campaign promises from both sides.

- Instead, Congress will name a commission to "re-examine" government's role in welfare programs.

## TAXES

**REVENUE NEEDED** for the fiscal year 1954 will be upwards of $75-billion. Exact figure depends on how much the Republicans can cut Truman's expected $85-billion budget.

- Present tax rates, even at today's high level of business, would yield around $70-billion.
- Any tax cuts before mid-1954 will merely add to the prospective deficit. That will mean tough going for Republicans, who have promised both tax cuts and a balanced budget.

**EXCESS PROFITS TAX** is slated to die automatically on June 30, 1953. Short of new outbreaks of war, Congress is in no mood to extend it.

- With defense spending due to level off at mid-year, actually drop before the end of 1953, E.P.T. will be going off just at the time business needs a financial boost. That's practically a guarantee that E.P.T. will not be renewed.

**CORPORATION TAX** rate is not scheduled to go down until April 1954, when maximum rate drops from 52% to 47%. There is no indication this schedule will be forwarded.

- End of excess profits tax will be major relief for many companies. Two tax reductions for corporations would stir up a political hornets' nest.

**PERSONAL INCOME TAX** rate is scheduled for an automatic decrease of 10% to 11% on Dec. 31, 1953. (That's the "Korea" boost.)

- There's a good chance the cut will come earlier. Congress will be under tremendous pressure to "match" the relief due corporations when excess profits tax ends June 30.
- Don't look for any cuts below this immediate pre-Korea rate until the cold war gets colder — by truce or otherwise.

**EXCISE TAXES** are fixed under present law to run until April 1954.

- Liquor, automobile, appliance lines will make a big drive for excise cuts in 1953. They stand little chance of success.
- If a sharp business downturn develops, then Congress would act quickly to cut excises as a stimulant to business. No one in Washington looks for this in 1953.

**TARIFFS** will be center of a fight in June when Reciprocal Trade Act is up for renewal.

- Eisenhower favors lowering trade barriers to strengthen allies with dollars earned in trade instead of with aid. Most Eastern Republicans and many business and banking groups agree.
- Mid-West and Western Republicans have a long protectionist record, won't change easily. They'll fight for at least holding tariffs where they are.

## EXPANSION

**DUAL-PURPOSE PLANTS** will get a big boost, may become national policy as a result of General Motors' Charles E. Wilson becoming Defense Secretary.

- Wilson has been plumping hard for the idea, actually had GM build one such plant. (For description of the plant and Wilson's proposed national policy, see FACTORY, July 1952, page 134.)

**FAST AMORTIZATION** certificates are slowing up. With the present phase of expansion almost complete — at least on paper — few more will be needed.

- Statutory authority for certificates expires on June 30. No real prospect of extension.
- The dual-plant idea, however, could revive the fast-amortization program. That would be the minimum amount of help a company would need to build a dual-purpose plant.

## SMALL BUSINESS

**SPECIAL AGENCY** — the Small Defense Plants Administration — will be abandoned. Perhaps right away, almost surely by June, when the law setting it up is due to expire.

- SDPA's functions will go to Commerce Dept. Eisenhower pledged that in campaign.
- You'll see how seriously Administration feels about small business when the new Commerce secretary either creates special bureau or merely tacks function onto some other office.

**DEFENSE AIDS** for small business are petering out — just as they are for everyone else.

- That means fewer loans, guarantees of loans, 5-year amortization certificates. But these programs were grinding to a halt anyway.

# LOOKING AHEAD IN LABOR

**Last-minute round-up as we go to press**

New top labor leadership . . .
New Eisenhower administration . . .
New Republican Congress . . .
Falling price index . . .

These big developments—none of them anticipated 6 months ago—have changed the labor picture.

Nothing like this has happened since the New Deal took over in 1933. What does it mean?

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Within organized labor, the leadership of AFL's new president, George Meany, doesn't bring unification of AFL and CIO any closer—despite his "invitation" to CIO for more unity talks. This could change if CIO falls apart as a result of bitter fight for leadership. Then AFL will just pick up the pieces, force CIO to return to the "house of labor" on AFL terms.

But let's assume Philip Murray's successor can hold CIO together. He will be confronted with a strong, united AFL bent on growing even stronger —in membership and prestige—at CIO's expense.

For employers, this means more raiding, more jurisidictional fights, more bargaining elections and the campaigning in the plant that goes with them. Labor feuding already under way will increase.

In electrical manufacturing, CIO will get more help from Justice Department in fighting left-wingers. More prosecutions for signing false non-communist affidavits are in sight.

In textiles, AFL is extending its drive against CIO into New England. In 6 months since George Baldanzi led faction out of CIO Textile Workers and back to AFL, AFL has taken some 20 plants with 20,000 employees away from CIO. Mostly in South and Middle Atlantic regions.

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In Washington, labor leaders must learn how to get along without "a friend" in the White House. Eisenhower will be friendly to both labor and management, not take labor's side against employers. This impartial attitude will sift down through the Administration into the Labor Department and eventually into the National Labor Relations Board. It will mean fewer White House visits by labor leaders.

At the bargaining table, look for a more conciliatory attitude, more readiness to settle. The chip will be gone from the shoulder. Less talk about taking the case "to Washington." Even before the Republicans come in, many strikes are being lost by stiffening employer resistance.

We are not forecasting fewer strikes ahead. Much will depend on employer attitude. Any widespread strategy to "get even" with unions will induce more, not fewer, strikes.

Cost-of-living escalators look less appetizing to workers now that those in the automobile industry had to take a 1-cent cut. Walter Reuther is under increasing pressure to shore up the escalator in UAW-CIO contracts, or get rid of it. He'll bring this up when the escalator is shifted to the new consumer's price index in the next few weeks.

In Congress, labor politicians say their "friends" have been reduced from 40 to 38 in the Senate, from 181 to 150 in the House. More important, however, is the switch in control. It put Republicans in charge of committees.

Labor committees will be headed by Taft in the Senate and McConnell of Philadelphia's "main line" section in the House. They see eye-to-eye on Taft-Hartley amendments. Even so, labor leaders prefer McConnell to present House Committee Chairman Barden, Southern conservative.

State legislatures are not being overlooked by labor leaders in assessing the Republican landslide. They fear another wave of restrictive state laws. Like 1947, last time Republicans won Congress. Voters last month approved a ban on compulsory union membership in Nevada and curbs on picketing and secondary boycott in Arizona.

NLRB RULES . . .

• You don't have to bargain with your union during a slow-down, but you can't insist that union accept more wages instead of "fringe" benefits, or refuse to furnish information about your group insurance plan. (Phelps Dodge Copper Products)

• You don't have to recognize union whose officer was convicted of signing false non-communist affidavit. NLRB revoked certification of CIO Packing House local at Camden, after conviction of Business Manager Anthony Valenti.

SEE ALSO PRACTICAL LABOR RELATIONS, PAGE 210

# LOOKING AHEAD IN BUSINESS

**Last-minute round-up as we go to press**

Factory production has made huge strides since the end of the steel strike. The Federal Reserve Board's index of industrial production held close to 220 during late 1951 and early 1952. It dropped to 193 in July during the strike. Now it has made a snappy recovery to an estimated 227.

This means that factory output has hit the highest level since 1944. Civilian production is now much higher than it was then. Can factories expect this rise in volume of business to continue, or even to hold up?

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Factory activity can be expected to hold up into the first quarter of 1953. Then some industries can expect a modest drop. The reasons for expecting some slowdown are: inventories are again building up, consumers are having a harder time making ends meet.

Businessmen added almost nothing to their inventories during the first part of this year. Beginning in the summer, the rate of inventory build-up began to climb to $2-billion a year. Part of this was caused by materials other than steel piling up during the steel strike. But part of it is caused by goods backing up. Retail stocks are being pared down slowly. Most of the inventory is being added by the manufacturer.

At the same time, consumers are having a harder and harder time stepping up their buying. Prices have risen as fast as consumer income during the past year. The result is, consumers have gone more and more into debt. Installment credit increased at a record rate from June to the present.

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The inventory situation and consumer spending are of great importance right now because defense spending and business spending for plant and equipment are both leveling off. Business investment in the future will be geared to civilian sales rather than defense orders.

Basic materials industries can expect to slow down first. The big build-up in supplies of minerals and other raw materials for defense needs is just about completed. The steel industry, for instance, is producing at a record rate of more than 115-million net ingot tons a year, but the industry does not expect to sell more than 105- to 110-million tons during the coming year.

Lead and zinc output often follows steel. Here a drop both sooner and lower is to be expected. Inventories of lead and zinc built up during the steel strike, and production rates are higher than last year. Copper production will not decline as much as lead and zinc because the threat of surplus is not so great or immediate. Aluminum output will probably rise throughout 1953 because of aircraft demands and the many growing uses for aluminum.

Chemical output is now slightly higher than a year ago. Industrial chemicals have recovered from an inventory recession, but probably the present rate of output can only be continued until mid-year. Growth chemicals, like plastics, synthetic fibers, and petrochemicals will probably have rising output during most of 1953. Coal mines have had over-production trouble for almost a year. It is likely to continue. Oil production is now outrunning demand and cutbacks are being considered.

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Among the capital goods industries, electrical machinery is by far the strongest. Output of power generating equipment will increase in 1953 to meet the demands of electric utility expansion. Industrial machinery makers have backlogs averaging three months or more. But output is at a new peak, well above a year ago. A lower level of new orders is likely since business plans for capital investment are slightly lower. Farm equipment output has been low, due to strikes. Some catching up in output is needed for stock. But farm income is likely to drift downward next year. This would lower machinery sales.

Automobiles are now being made at a rate above the expected level of sales for next year. Most dealers are heavily loaded with inventory. Appliance output has recovered from the slump of early 1952. Inventories are in better shape. But consumers will probably not continue to buy appliances on credit at the present rates.

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The clearest thing about the prospects for 1953 is that there will be many ups and downs. Next year may be like last, a year of "seething stability."

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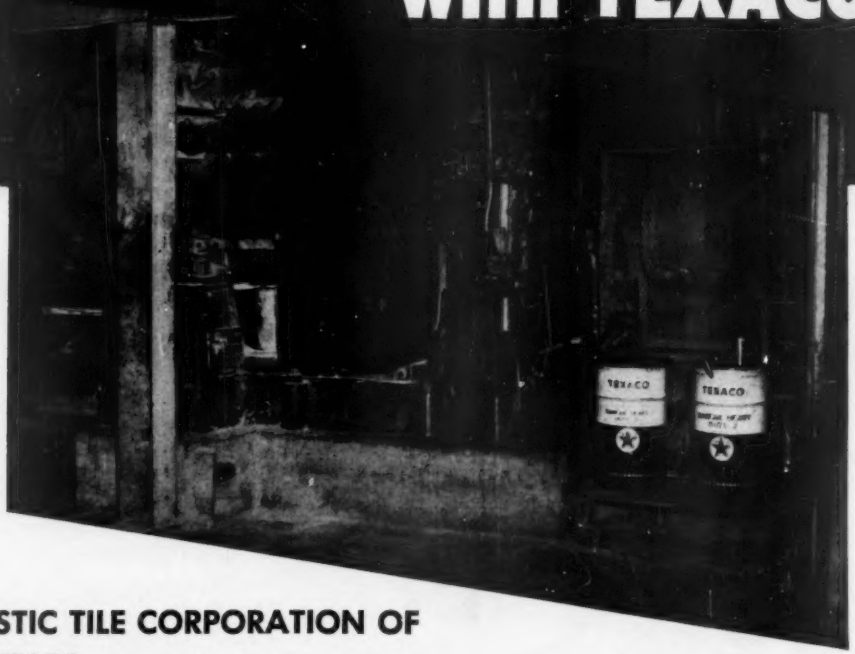


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FACTORY MANAGEMENT AND MAINTENANCE

HARRY LEE WADDELL, EDITOR

# The Election Puts You on a Spot . . .

. . . you and every other member of management. And it doesn't matter how you voted.

Here's why:

For years management has felt itself to be the "whipping boy" of the national administration. As a result, operating executives have all too often felt on the defensive—regardless of their own personal political beliefs. They've been "agin" many of the things the administration has done. They've found it easy to lapse into a negative kind of thinking about national policy.

Now there's a grave danger that exuberant executives may get the new administration off to a bad start in the place where a good start counts the most—*right in your own shop, among your own employees.*

One executive has already put the situation this way: "I think management right now is on its own 1-yard line. It has to carry the ball up the field and make real progress. If it doesn't, it will lay the groundwork for a greater drive four years from now than ever before toward 'putting management in its place.'"

**In much plainer words, here's what it means to you:**

More importantly than you think, your employees and the people in your community are going to evaluate the results of this election landslide in terms of your personal behavior.

Are you tempted to do some gloating—perhaps to imply to your union boys that they'd better watch their step, that "things" are going to be different? *Don't do it.*

Are you tempted to let people know (if you're a Republican) that you've waited 20 years for this big victory, and plan to make the most of it? *Don't.*

Management in many ways is in a position similar to that of the Labor Government in England a few years ago. British labor leaders rapidly discovered it's one thing to stand on the sidelines and point out what was wrong with the opposition. But it wasn't quite so easy to figure out and *do* what was right when the roles were changed.

**Keep this one point in mind:** The Republican Administration isn't a management administration—and it can't be if it is to be a powerful and effective force for the good of the nation. That administration must represent truly—and utterly fairly—the best interests of *everyone.* That includes organized labor, and business, and the farmer, and the consumer—and it includes *you,* as an individual and as a plant executive.

Your first big job is to communicate an attitude to your employees—an attitude of restraint, hope, and cooperation. You must convince labor and individual workers that you *haven't* just been waiting 20 years to "get even"—to turn the clock back to the "good old days."

As President-elect Eisenhower said in his "victory" statement: "This is a day of dedication rather than of triumph."

It's a time to proceed with restraint and good sense. Everything you say and do is going to be observed more carefully than for many a year. Say and do the right thing—and you'll give no one the chance for "I-told-you-so's." And you'll get your thinking, and the thinking of your workers, off to the right start—positive and constructive, rather than vindictive.

Harry Lee Waddell

# How to Rough-Sketch Your Ideas on Paper

By EDWARD H. FREEDMAN • Author of *Conversational Drawing*

THIS ARTICLE DOESN'T AIM to make you an artist. It's really about ideas—*your* ideas, and how you can get them across better to others.

Its main purpose is to save you time and effort, to help you to be a more effective "idea salesman." By following its simple suggestions, you can portray ideas more accurately and more vividly, so others can understand them easily.

The way to accomplish these desirable aims is to learn rough-sketching, or "conversational drawing," as it's more correctly called.

You probably can't draw well. Few executives can. But that doesn't mean you can't learn to be an excellent rough-sketcher of just about anything that's important to your job.

Best of all, you can learn to rough-sketch without long study or hard work. And, once you've mastered the simple technique, you will probably find you're able to use it with profit.

**THE PROBLEM LOOKS TOUGH** · To people who don't know how to draw, the greatest difficulty comes in knowing at which point to start the drawing. This is particularly evident when the object is complex, with many gadgets going in many directions.

You all know how to draw plans, and read plans, but do you all know how to bring them to life quickly on a sheet of paper?

The method of making a rough sketch described here will overcome any frustration you may feel about not being able to draw well enough to get your ideas across.

**THE SOLUTION IS EASY** · Follow these simple rules and you can't go wrong:

1. Look at simple objects such as water tumblers, cups, vases, books, filing cabinets, and cigar boxes and determine whether their outer forms would be fashioned from cylindrical or box shapes.

2. Look at complex objects like motors, furnaces, hoists, and valves. Focus your attention on the general contour and make the same determination.

This is elementary but most important.

## USE A FIRM STROKE

If you were asked to write the number "1100" in numerals about four inches high, you wouldn't hesitate for a moment. The same direct strokes you use in writing numerals of any size should be used in drawing straight lines, curved lines, and ovals.

DON'T DO THIS

WHEN IT'S EASIER TO DO THIS

## HOW TO HOLD YOUR PENCIL

My advice to you is that you hold your pencil precisely as you hold it when writing words or figures. That is your natural style. Write your signature several times and observe that you use a flowing easy style. That's exactly the way to make conversational drawings.

## A BASIC IDEA ABOUT CYLINDRICAL FORMS

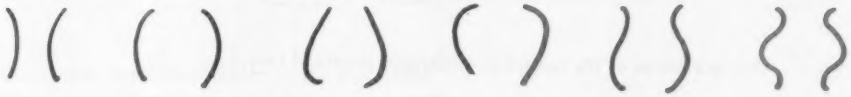
When you write 1100 you draw two "ones" and two zeros. In art they're called straight lines and ovals, and they're very useful.

When you draw two ovals horizontally in this position

and draw the "ones" as they join the ovals you draw a cylinder.

To demonstrate a simple device that proves the importance of ovals, draw a series of two sets of the same size ovals.

Now connect the ovals with curved lines like these.



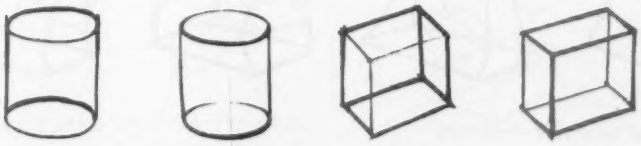
You have drawn these objects.

Draw a combination of large and small ovals and you increase the variety.

I'm sure you can draw many more of your own.

## ELIMINATING CONFUSION OR OPTICAL ILLUSIONS

The overlapping of front and rear construction lines may tend to cause confusion.
This can be avoided by erasing the rear lines or by strengthening the front lines.



*Turn the page*

*Begins on page 84*

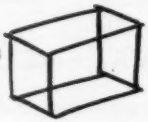
## A GENTLE HINT... RELAX

Draw your lines with single strokes. "Rough sketch" means just what it says. Accuracy of length of line, direction, and joined corners are not important. True perspective is not important in a rough sketch. I use the quadrangle and call it a rectangle . . . namely, a rectangle in perspective. By using ovals and rectangles you get automatic perspective.

## A BASIC IDEA ABOUT RECTANGULAR FORMS

When you draw two rectangles, one directly above the other

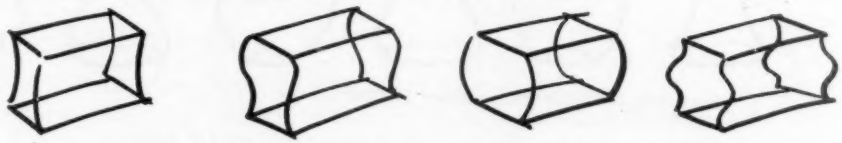
and connect the corners with straight lines



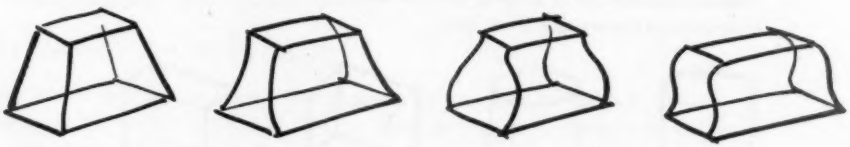
you draw a box.

Draw a series of the same size rectangles in sets of two . . .

then connect the corners with curved lines and you create odd forms . . . all based on the simple box or rectangular form.



You can create countless other forms by varying the proportions of the top and bottom rectangles and the lines that connect them.



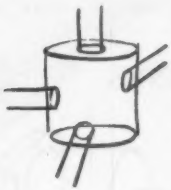
Try some of your own creations.

# AN INTERESTING OBSERVATION

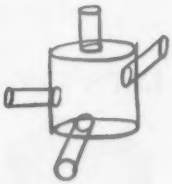
When you draw a cylinder

and want to attach a number of cylindrical forms to it, draw ovals at the points of contact . . .

and then draw lines in the direction you want the added forms to go.



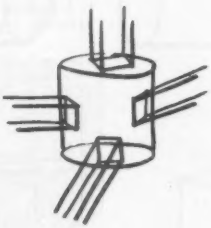
Finish them off by adding ovals



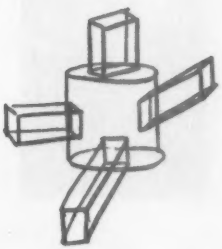
Let's start with the cylinder again . . .

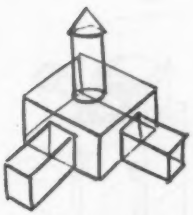
and this time add box forms to it by first drawing rectangles at the points of contact.

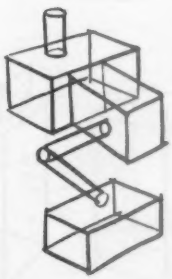
Draw lines from the corners of the rectangles in the direction you want the boxes to go.



Cap the lines with their respective rectangles.







A few other examples. Try some.

*Turn the page*

*Begins on page 84*

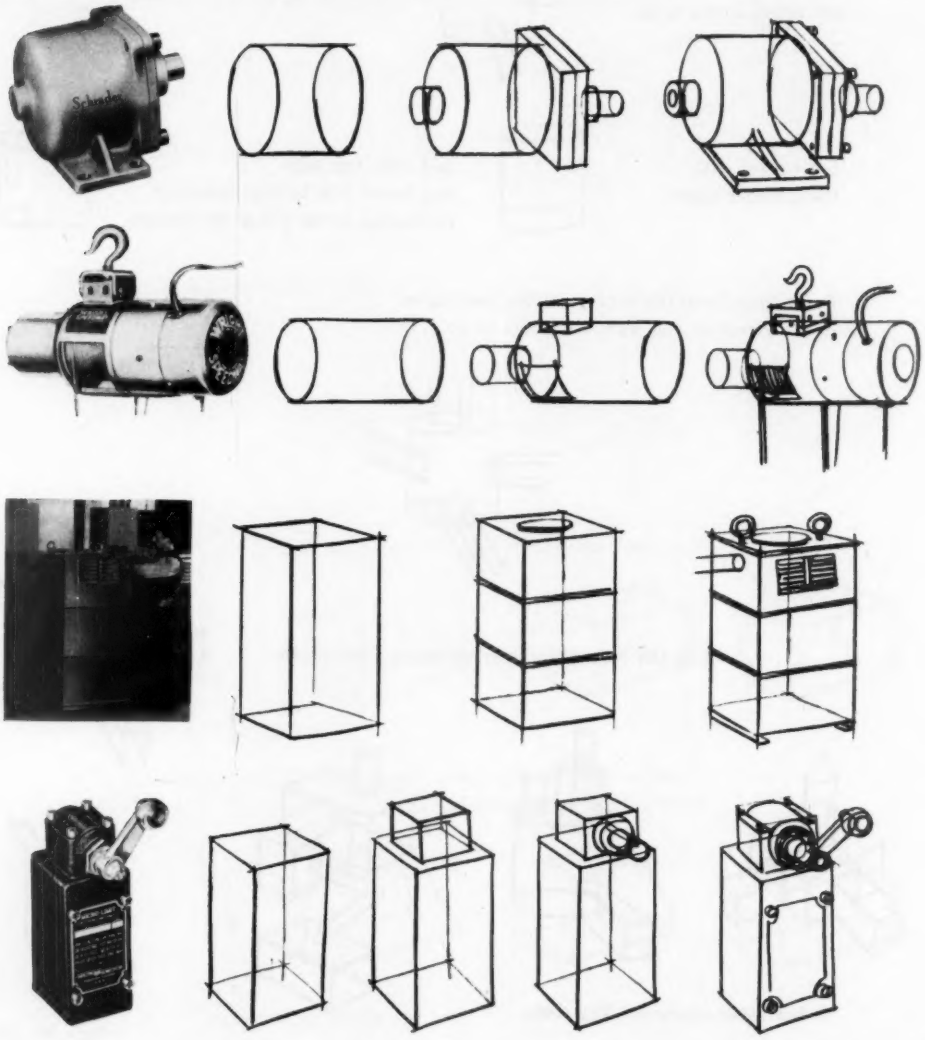
## HOW TO START DRAWING AN OBJECT

Look at it to determine whether the main body is cylindrical or rectangular. Then . . .

1. Draw the cylinder or box that represents the main body.
2. Add to it any other basic forms that you see.
3. Draw the details.

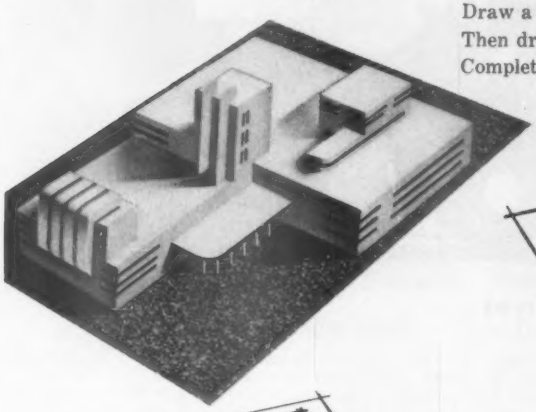
This procedure is enlarged upon when the object is more complex.

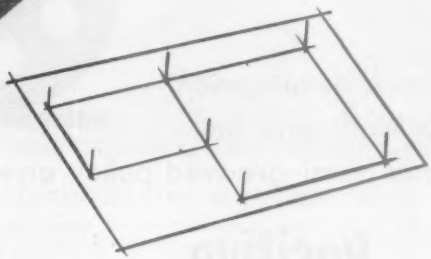
## LET'S TRY A FEW SIMPLE ONES.

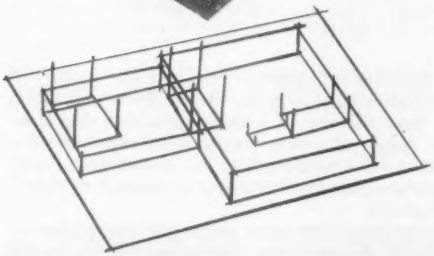


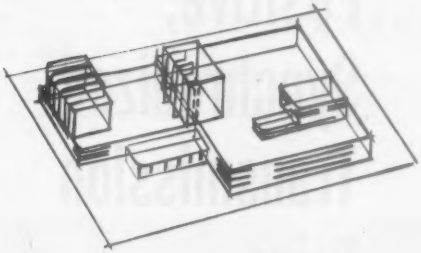
# HOW TO ROUGH-SKETCH A STRUCTURE

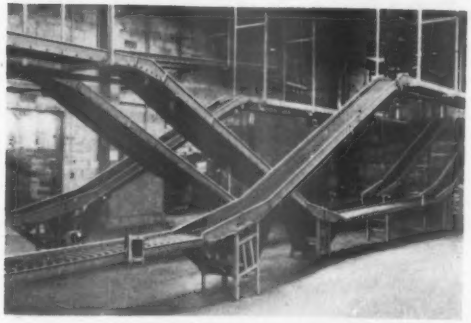
Draw a rectangle to represent the plot of ground. Then draw the floor plan and add the uprights. Complete the boxes and add the details.

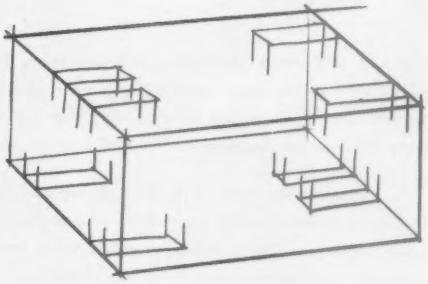


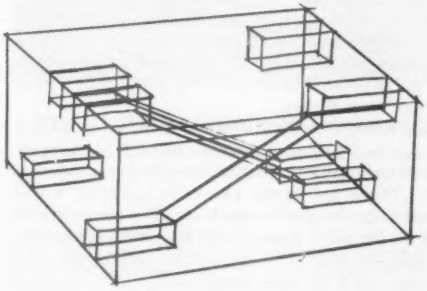


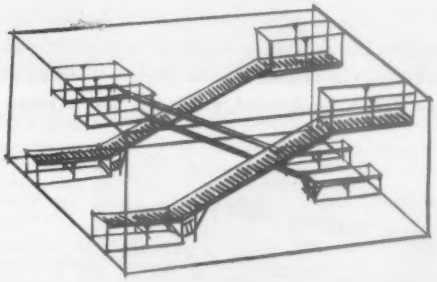












Latest development
in tooth-grip belt
and axial-grooved pulley gives...

# ...Positive, Synchronized Transmission Drive

**Whether you want perfect synchronization in shaft speed or low-cost mechanical power transmission, or both, here's a unit that will solve many of your mechanical-drive problems.**

**Production men will like it because it eliminates poor quality caused by the slightest speed variation. It's a smooth, quiet drive that promises long service and less downtime.**

**Plant engineers will like it because it's easy to install and maintain, needs no lubrication, and can be used on existing gear-, chain-, or belt-driven equipment within its power range.**

AS POSITIVE [IN ACTION] as a gear drive—as flexible [in application] as a belt drive. The combination of these features in a single drive has long been the dream of power-transmission engineers. For such a drive would utilize the advantages of both these accepted types of drives to transmit mechanical power.

A cog-type belt with gear teeth was the logical answer. But there was always one trouble in any previous designs—the belt teeth moved together when rounding the geared pulley, and soon got jammed or all chewed up in the gears.

This problem has now been solved in the design of what the maker calls a Timing belt. But don't let this trade name fool you into thinking that timing is all it's good for. Because of its many advantages, FACTORY editors foresee a bright future for this belt drive in the power transmission field.

The Timing belt was patented in 1950 by R. Y. Case, an engineer of the Gilmer plant of the New York Belting & Packing Company. Up to now Gilmer has developed and improved the product on a limited scale. All applications have been engineered for specific jobs.

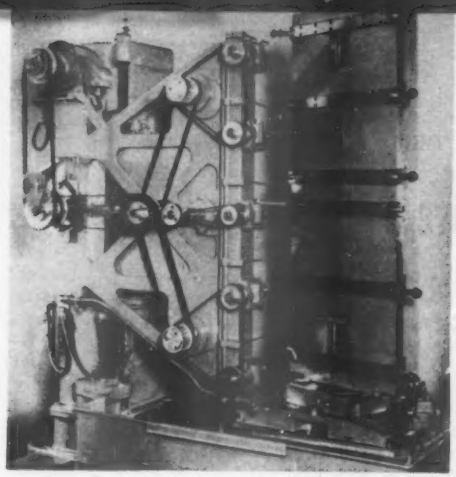
Tests and years in actual service have revealed a growing demand for this drive in many diversified applications. As a result, packaged drives—belts and pulleys—will be available in stock sizes within the next few weeks.

This drive, FACTORY feels, is more than just an improved version of an old concept. It's a major improvement in the mechanical power transmission field. There are many places in industry where it will improve plant operations. The performance data on the page opposite and the case applications on page 92 will help you decide where and how you can use it in your plant.

**To test your reading ability . . .**

Read this article at your normal rate of speed for general information. For test purposes, do not examine pictures or read captions.

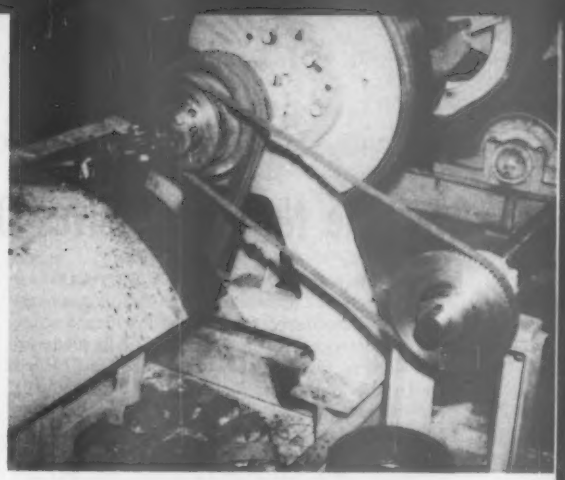
Record your exact reading time in minutes and seconds. Then turn to page 283 and answer the questions based on the article.



## Multiple-pulley drive—positive speed

**Application:** Eight belts, running on 14 pulleys, drive a 4-spindle Pratt & Whitney precision duplicator. This machine profiles four turbine engine blades from a master blade. Main drive, 2 hp., 1625 rpm., using belt ½ inch wide.

**Benefits:** Here's a case where it would be practically impossible to produce this machine with any other type drive. Flexibility of the drive permitted utter simplification of the machine without any loss of precision in its product.



## Synchronized drive—no lubrication troubles

**Application:** Wire-rope stranding machines at Jones & Laughlin Steel Corporation, Muncy, Pa. Belt width, 1 inch. Belt speed, 1855 fpm. Prime mover, 20-hp. motor, 900 rpm. Drive maintains constant-speed ratio between tube rotation (which weaves wire) and capstan (which pulls wire out).

**Benefits:** Eliminated maintenance headaches because of difficulty of lubricating former chain drive. Also eliminated serious bearing trouble. Can now run machines 25% faster.

## Low-cost drive—efficient—easy on bearings

**Application:** Blower drive at Naugatuck Chemical Company. Prime mover, 140 hp. Belt width, 8 inches. Belt speed, 3300 fpm.

**Benefits:** Replaced a 22-in. V-belt drive. Reduced initial belt tension from 2500 pounds to 100 pounds, thus improving operating efficiency and permitting longer bearing life. Has been in continuous operation without trouble for nine months.

## High-ratio short-center drive—no slip—no noise

**Application:** Narrow fabric loom made by Crompton & Knowles Loom Works. Center distance, 22 inches. Belt width, 2 inches. Overload 300%-450% about 115 times per minute. Prime mover, 2-hp., 1150-rpm. motor.

**Benefits:** Has been in service 36 months without trouble. Replaced positive gear drive and friction clutch which were noisy and short-lived. *Turn the page*

# Why the New Belt Solves Drive Problems

**BELT DESIGN AND CONSTRUCTION** · The Timing belt has the same appearance as a flat belt, except that it has regularly spaced teeth which engage corresponding grooves in the pulley. It is made up of an endless layer of tension members of cabled wire (heavy and light duty) or cord (lighter-duty) in a fabric jacket. This jacket also encloses the tooth elements of oil-and-heat-resistant neoprene stock which are vulcanized to the flat layer.

The belt teeth are designed to roll into and out of the pulley grooves with negligible friction. A light-duty belt weighs only 0.09 pounds per foot per inch of width. Yet the drive has a 10:1 strength safety factor.

The belt has already been made in sizes up to 15 inches in width and 140 inches in length. Stock sizes now range from ½ inch to 3 inches in pulley widths, and from 1:1 to 12:1 in speed ratios, to start off the line. No doubt larger sizes will follow as the demand arises.

**PERFORMANCE CHARACTERISTICS** · The following features in drive performance make you realize the wide field for use of the Timing belt.

- **No speed variation.** Assuming constant feed of the driving pulley, you will get constant angular velocity of the driven pulley. This means uniform rpm. or constant linear speed—take your choice.
- **Wide speed limits.** The belt will run literally at inches per minute, or as high as 16,000 fpm. High speed is possible because the lightness of the belt cuts centrifugal force, and the high belt strength can take whatever forces do occur.
- **Big power range.** A light-duty belt will handle 7.7 hp. per inch of width at a belt speed of 6000 fpm. A heavy-duty belt will handle 17 hp. per inch of width, at the same speed. Drives of 600 hp. have been in service 2 years and more without evident wear.
- **Low power loss.** You're not bending a thick belt over the pulleys. So there's negligible heat and horsepower loss by flexing—heat is too little to be measurable.
- **Small arc of contact.** Belt drive can be designed for a pulley contact as low as 40 degrees. It works as well on high-ratio, short-center jobs, where you dislike to use belts, as it does on long centers where you can't use gears. Speed ratios of 30:1 are possible. Flexibility of the belt carcass permits operation on pulley diameters as small as ½ inch at 10,000 rpm., even with a comparatively heavy load.
- **No stretch.** Thus you can use fixed-center drives—no take-up adjustments are necessary. No creep to affect speed.
- **No initial belt tension.** You can slip belt on or off pulley by hand. This means lower bearing pressure, less wear, the use of cheaper bearings, and negligible efficiency losses.
- **No lubrication.** Not one bit needed. No oil casing to add. Yet this drive will operate normally in oily, wet, or hot conditions if necessary. And the drive is relatively quiet even at high speeds.
- **High shock-load resistance.** High strength of belt will withstand overloads of 300% in sudden starts or stalls. No belt breakage, to date.

**WHERE TO USE THIS DRIVE** · You can use the Timing belt drive to advantage where you need precision drives. It looks like a natural for synchronized drives, as in automatic machinery. Its no-slip properties are ideal for jobs where constant surface speed is required. For example, it eliminates wheel chatter on a high-speed grinder, and prevents gouge marks by a sander.

This drive is small and compact. Size for size it will transmit considerably more horsepower than V-belts. Cost of drive will be a negative factor, whether or not compactness rules. As horsepower goes up comparative cost with other types goes down.

You can use this drive with a single belt over a multiple number of pulleys, or with idlers. It is more sensitive to misalignment, we are told, than V-belts or flat belts. But it is not as sensitive as gears or chains. Because of its widespread characteristics, you need to "engineer" the belt carefully to assure the best results in application.

Now take another look at the profitable applications illustrated on the preceding page. They should suggest to you how the Timing belt drive can solve production problems and simplify maintenance operations to reduce plant operating costs.

**In the back pages of *FACTORY* you'll find . . .**

. . . a listing of informative **catalogs. Page 142.**
. . . descriptions of **new plant equipment. Page 150.**
. . . news and hints about **labor relations. Page 210.**
. . . suggestions to help you solve current **plant engineering problems. Page 244.**
. . . tips, suggestions, new solutions to **plant operating problems. Page 248.**
. . . **You Mustn't Miss** news from industry—new ideas, new developments, pointed quotes. **Page 254.**
. . . reviews of **books and booklets. Page 304.**
. . . and other departments.

**You'll find a complete list on page 3.**

Industrial Engineer Charles Winkelman

and

FACTORY'S camera give you

# FORD'S AUTOMATED ENGINE PLANT

By CHARLES WINKELMAN
Director of Industrial Engineering
Gardner Board & Carton Company
Middletown, Ohio

A factory of the future that's here today—the plant FACTORY gave you a quick look at in April 1952 (page 94).

I SPENT A SOLID DAY touring the Cleveland Engine Plant with Ford Motor Company executives. It was an overwhelming experience.

The plant is an outstanding example of automation – automatic delivery and movement of materials to, through, and out of automatic production machines and processes. You can't possibly absorb it all in one day.

So, after I got home, I did a lot of thinking about what I had learned, and – very important – what more I wanted to know.

Of course, I was trying to relate what I had seen at the Engine Plant to paper manufacture. But, in doing so, my mind was necessarily full of "maybe's" – because I'm new in the paper industry. Most of my years were spent in electrical wire manufacturing. So it was only natural, I think, for me to "react" more in terms of my experience in light metal fabricating and assembly.

Maybe that background will help you understand why my "second thoughts" led me to list these four things as my most lasting impressions.

**1. Amount of automation.** Sometimes whole departments with only a handful of employees to monitor control panels.

**2. Operation of automation devices on engine blocks** – how they are constructed and how they are controlled. Engine blocks are big. So is the equipment to "handle" them. Here I found truly *complete* automation—in its most dramatic form.

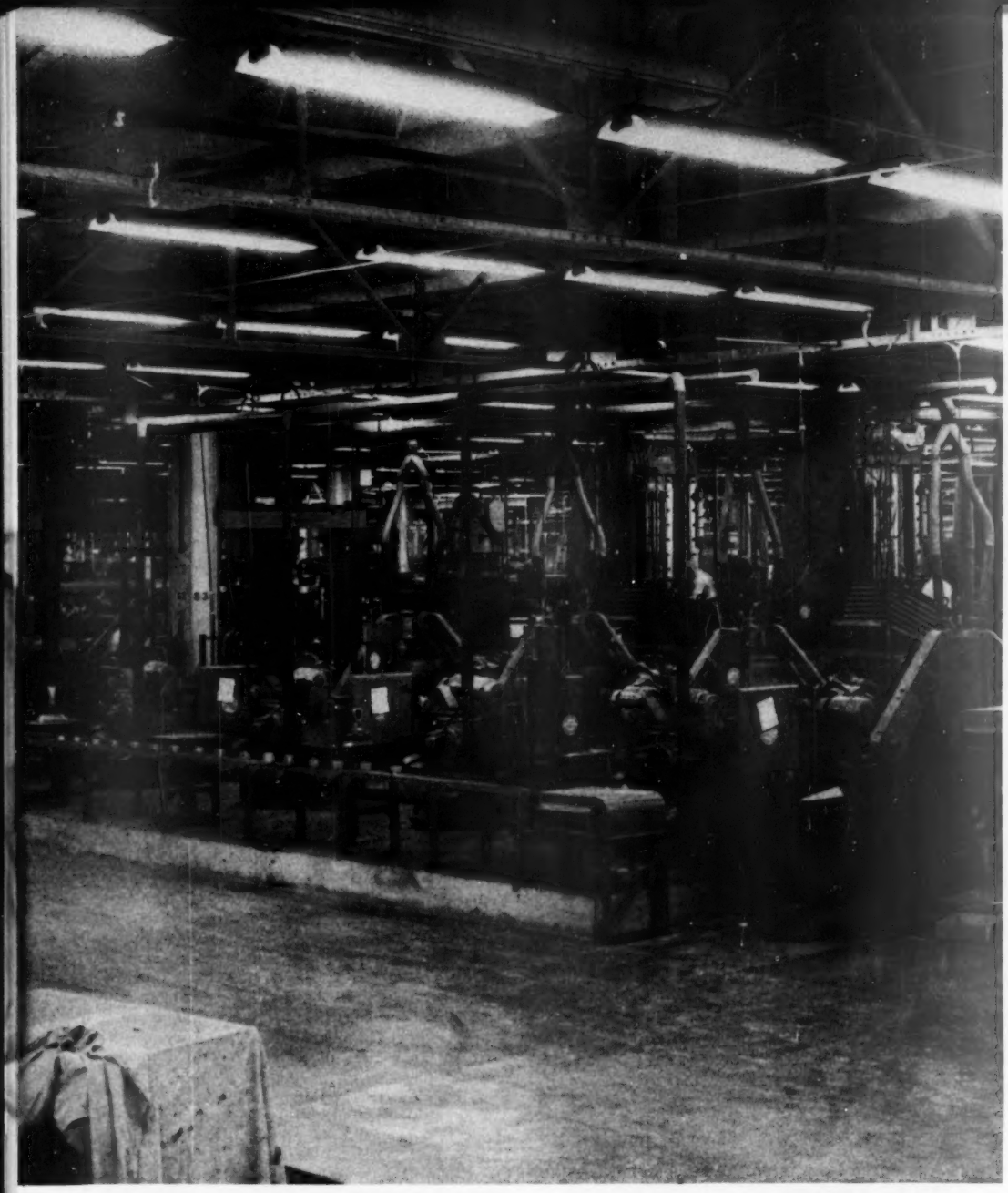
**3. Operation of automation devices on the piston line.** Here automation is advanced, but so far Ford hasn't found it economically profitable to automate 100%. It's a good example of what you can do—profitably—short of "all-out automation."

**4. Apparent absence of in-process inspection.** You seldom see an inspector in the plant. But this is deceiving – because often the "inspectors" are mechanical devices built right into the production machinery. Actually these "inspectors" control machines in such a way as to make sub-standard parts virtually impossible. So few get through any process that the cheap way to catch them is after all processing (or even assembly) is complete.

At my suggestion, the editors are devoting the next ten pages to giving you these same impressions, in photographs and sketches.

Now, as to the things I wanted to know more about, I made some notes and sent them to Robert Dilley, FACTORY's editor in Cleveland. Bob spent several days with Ford automation experts getting the answers. The editors and I agreed that you ought to share this information with me. So Bob has reorganized my notes in question form, and, beginning on page 104, brings you "Answers to 13 Key Questions About Automation."

TO SEE WHAT AN AUTOMATED PLANT LOOKS LIKE, TURN THE PAGE

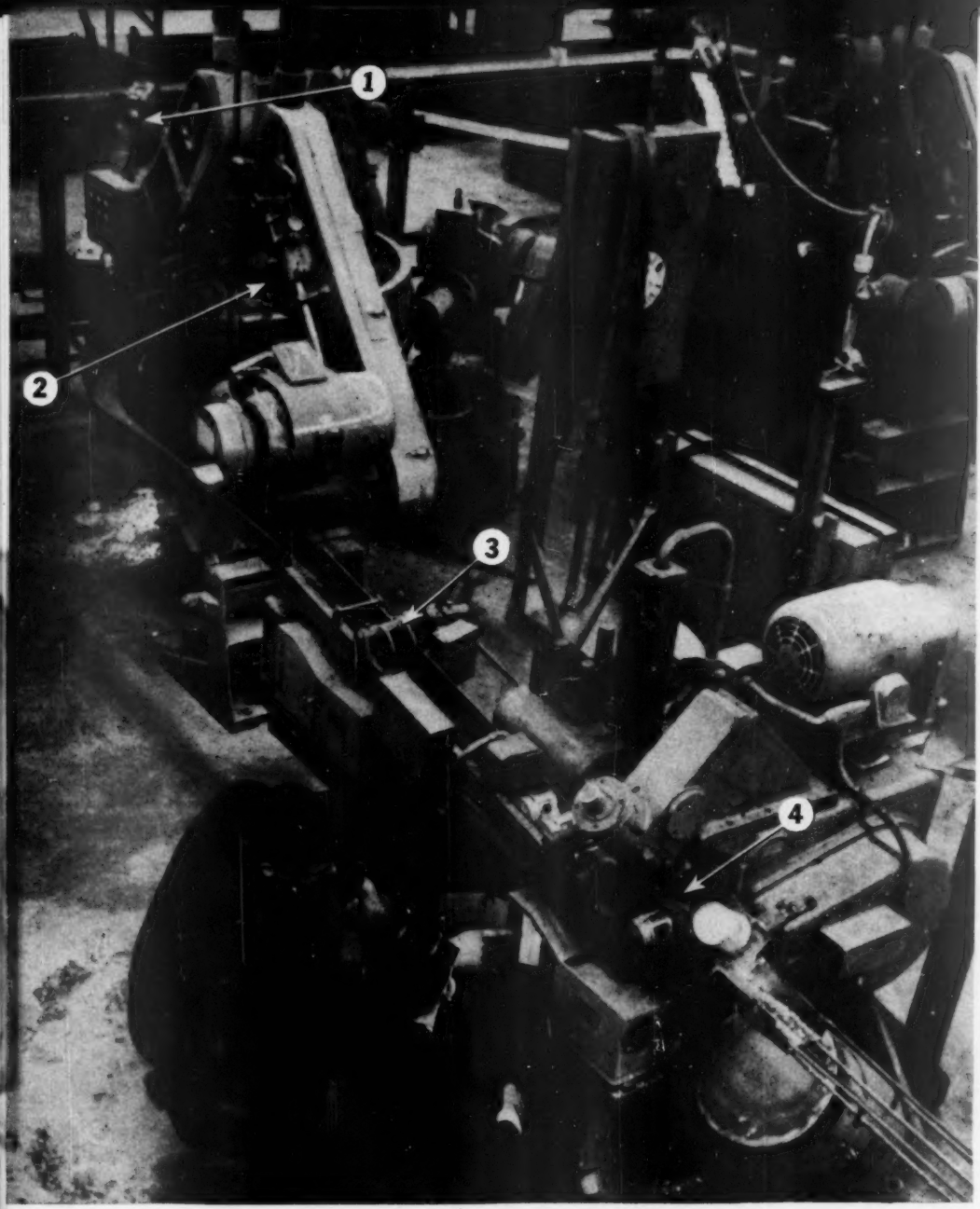


*Begins on page 93*

# AUTOMATED LINE RUNNING FULL BLAST

AT FIRST GLANCE this doesn't look much different from other well-mechanized metalworking plants. It looks quite conventional. Not at all like something from Mars. The real drama is found, not in its appearance, but in its accomplishments.

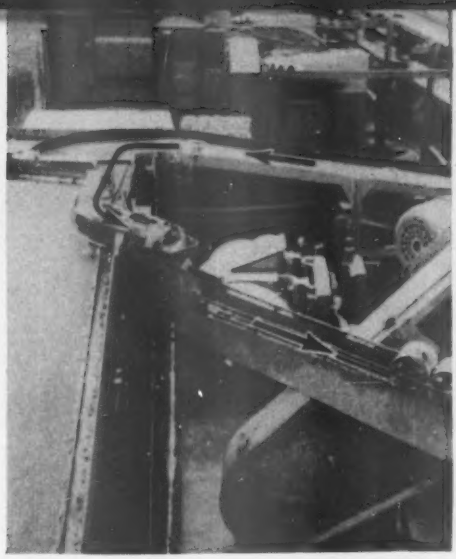
The picture above was taken while the department was in full operation—machining pistons for Ford's 6-cylinder engine. The scarce element is people—few are needed here, except for inspection, maintenance, and tool change. *Turn the page*




*Begins on page 93*

## AUTOMATED PISTON LINE

Actually, automation is not complete on the piston line, although it is on the section shown here. Winkelman and his host examine the Shadograph mechanism that controls the milling of excess material from the piston. The sequence of operations, as numbered above, is described in the detail photographs on the opposite page.

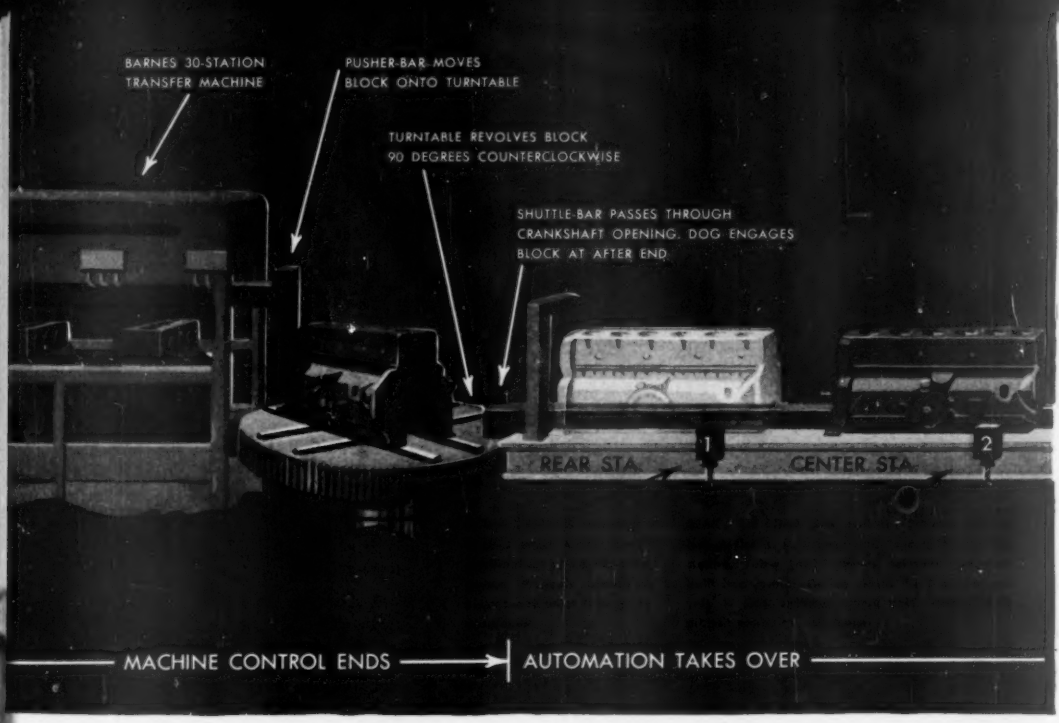


1 Rough-finished and grooved pistons are transferred from one belt conveyor to another by curved plow. Chute carries them to Hammond machine. If chute is full, pistons move around it and belt carries them to next machine station.

2 Air cylinder (1) pushes piston into each fixture of Hammond deburring machine as it indexes past loading point. Second air cylinder (2) ejects piston. Limit switches stop machine if piston is not fully in place or if chute to Morris miller is full.

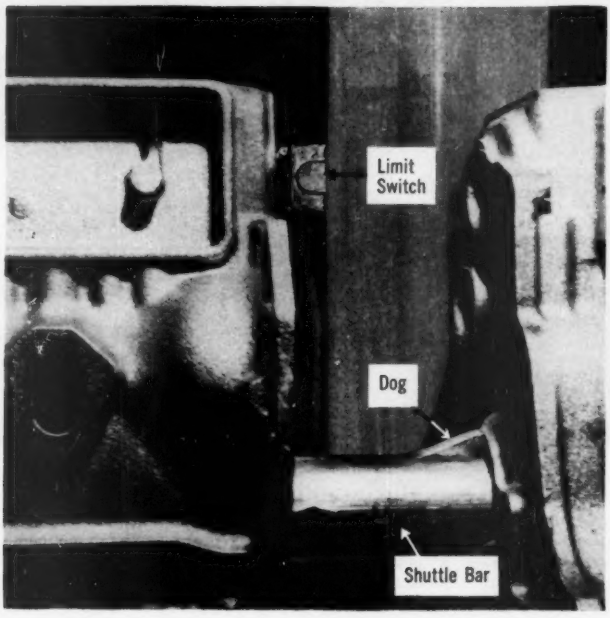
3 Piston is stopped and weighed by the first Shadograph (beam of light on photocell). It lets piston within acceptable weight range pass to miller. Underweight or overweight pistons are rejected; they drop down through chute to floor.

4 Second Shadograph reweighs "accepted" piston, presets miller to remove exact amount of metal. This happens while piston ahead is being milled. After milling, pistons roll down chute and are tipped up on belt, ready for next operation. *Turn the page*

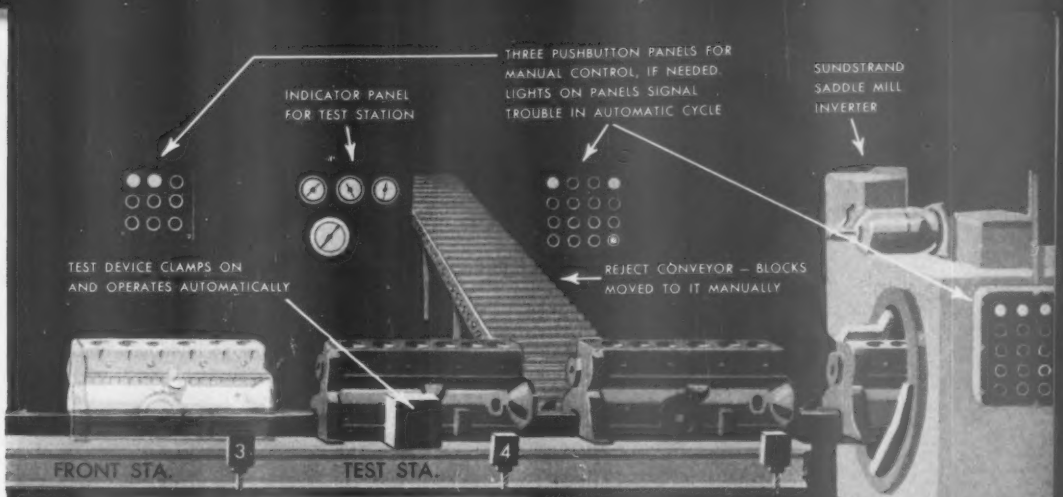



# AUTOMATION ON THE BLOCK LINE

... *Begins on page 93*



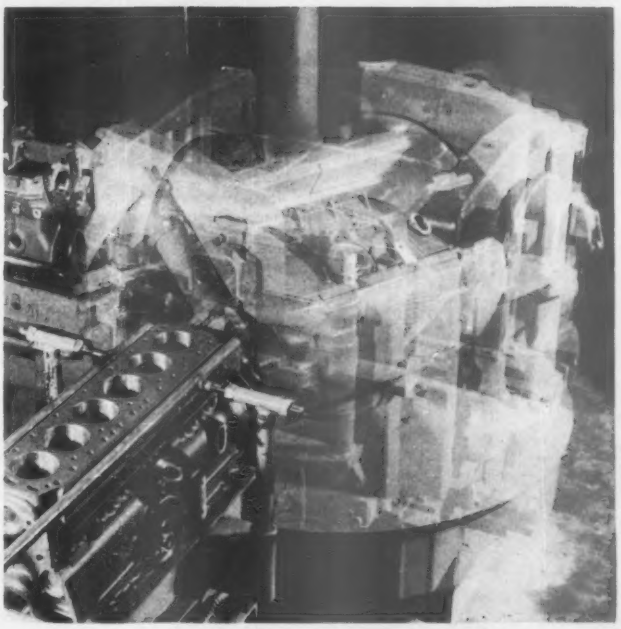

**FORWARD MOVEMENT OF BLOCKS** is effected by shuttle bars along line. Bars extend through crankshaft bore, act much like a plunger. As bar moves to left, blocks are held in position. Spring action on dog allows it to depress and move through block. As it emerges from other end of block, dog springs up. As bar moves to right, dog engages block and pulls it along. Bar can't move block until limit switch signals position ahead is clear and will accept block.


THREE PUSHBUTTON PANELS FOR MANUAL CONTROL, IF NEEDED. LIGHTS ON PANELS SIGNAL TROUBLE IN AUTOMATIC CYCLE
INDICATOR PANEL FOR TEST STATION
SUNDSTRAND SADDLE MILL INVERTER
TEST DEVICE CLAMPS ON AND OPERATES AUTOMATICALLY
REJECT CONVEYOR — BLOCKS MOVED TO IT MANUALLY
FRONT STA.
3
TEST STA.
4

**AUTOMATION TABLE** shows how devices are controlled by limit switches. Bottom line shows set-up sketched above.

| 1 | 2 | 3 | 4 | AUTOMATION |
|---|---|---|---|---|
| REAR STA. | CENTER STA. | FRONT STA. | TEST STA. | |
| OCCUPIED | OCCUPIED OR EMPTY | EMPTY | OCCUPIED OR EMPTY | MOVE |
| OCCUPIED OR EMPTY | " | OCCUPIED | EMPTY | " |
| " | " | " | OCCUPIED | NO MOVE |
| EMPTY | OCCUPIED | EMPTY | OCCUPIED OR EMPTY | MOVE |

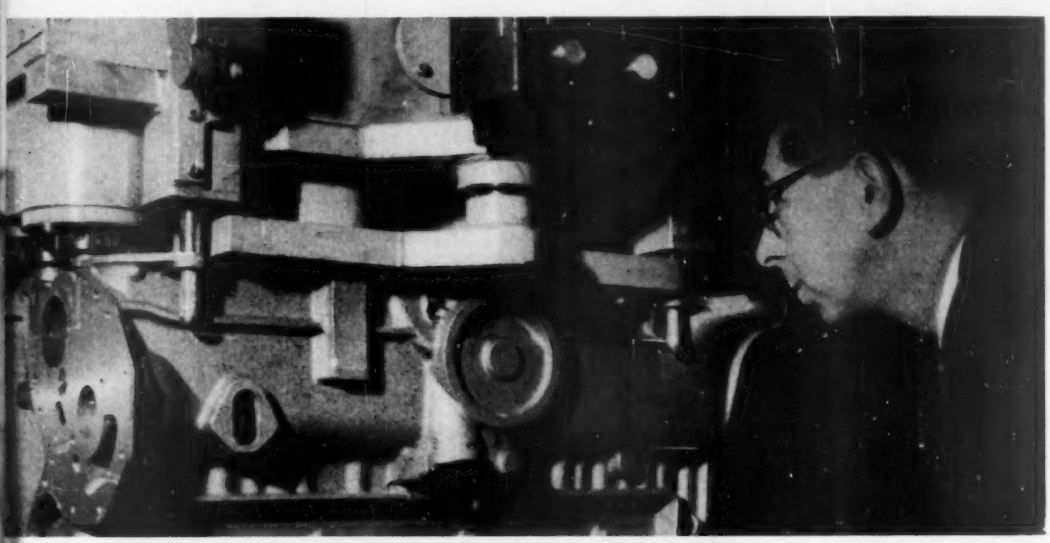
AND ENDS → | MACHINE TAKES OVER →



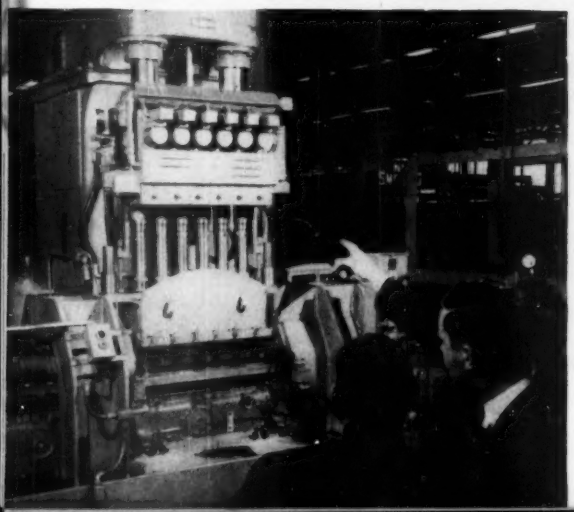
**COMPOUND AUTOMATION DEVICE** does two jobs at once. It turns block 90 degrees and inverts it. Operation of the device is shown in multiple-exposure photograph. In effect, this is a combination of a turntable and rollover such as the ones shown in the schematic diagram above. In upright position, block is pushed from lower left into device. It is pulled off by second automation system, in inverted position, at upper left. Limit switches interlock the two shuttlebars (see opposite) and compound device.

# AUTOMATION BY DEGREES

You don't have to automate every operation 100% in order to automate at all. Even in the most automated plant in the world, there's at least one operation (distributor cap assembly, see page 102) that has no automation at all. Other operations are only partially automated. Here are views of nine operations at the engine plant that run the gamut from no automation to complete automation, as seen by Charles Winkelman. The Ford executives seen with him in these pictures are H. D. Rowe, plant manager; Patrick Masi, superintendent, machining; and Lawrence Zirbes, superintendent, assembly.



**EIGHT BOLTS AT ONCE** are torqued home on the bearing caps as Winkelman watches. This not-quite-automatic machine locates guide holes in the underside of the block. If the block is not positioned precisely, a red signal lights and the machine stops until manual adjustment is made. The eight heads rapid-torque to the last thread at 30-lb. pressure, then slow down and torque at 100 pounds. When bolts are home, other signals light up and the machine stops. The block is then moved to the next operation.



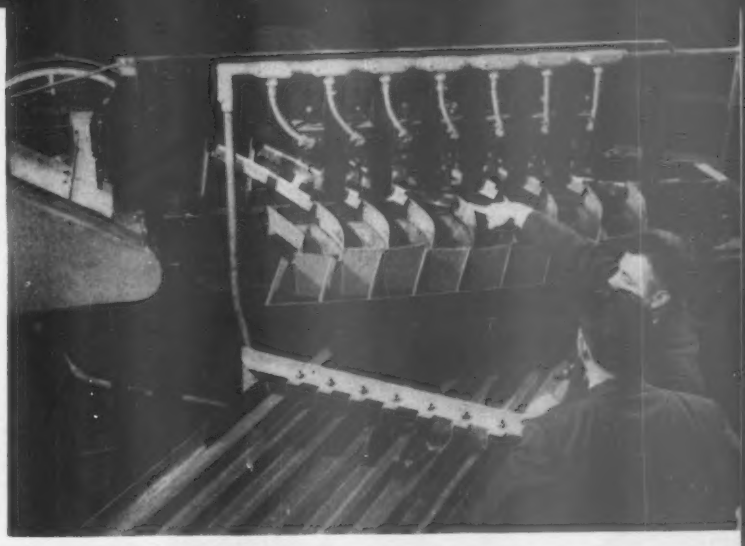
**THREE "FIRSTS" FOR ONE MACHINE.** It's an automatic wet hone. It's an in-line hone—blocks flow through it in regular production sequence. It remotely adjusts to eight cylinder sizes.

As the block automatically positions, honing starts. Ordinarily, it takes 15 to 17 passes of the hone (about 12 seconds) to complete the cylinders in a block. As the hones wear, the operator adjusts a dial to compensate for wear on the stones and control diameter limits. After about 400 blocks, the hones must be changed.

Both cylinders and pistons are made in a range of sizes. Selective matching at assembly assures perfect fits, yet permits more flexible tolerance standards in manufacture.

**RAPID OBSOLESCENCE** is a symbol of the times. This selective weighing device—installed only a few months ago—weighs and classifies 600 connecting rods per hour. A new scale, based on the photo-cell shadowgraph principle (page 97), is being built for this plant. It will "process" 1100 rods an hour.

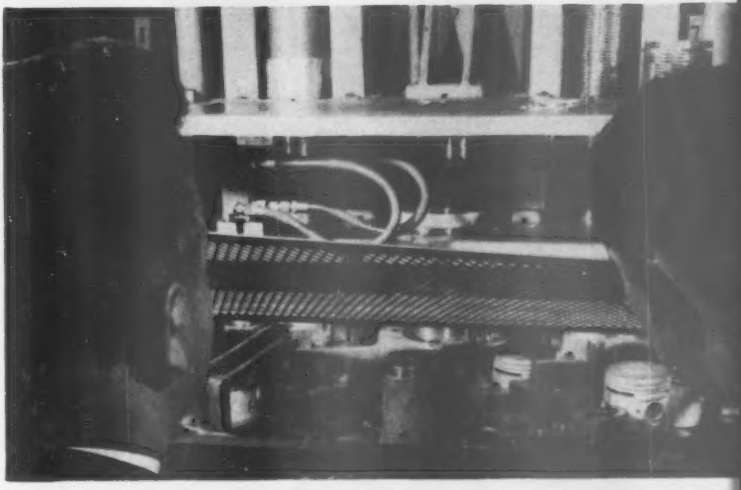
In the present set-up, as the rod passes over the scale, it trips one of eight switches. The switch operates a solenoid which drops the appropriate gate to deflect the rod into one of the eight chutes. The chutes deliver the rods into corresponding channels on a 30-in. conveyor belt moving to the next operation. Each channel delivers the rods to a selected broach for stock removal.



**AUTOMATIC ASSEMBLY** of pistons and piston rings is a reality. But only after trial-and-error adjustment of this specially designed machine. The big problem until now has been ring breakage. And Ford was about ready to give up the idea when this machine was made to work.

Rings are applied by three heads simultaneously. As piston enters the machine, it moves from head to head. At each station, one ring is slipped into its retaining groove.

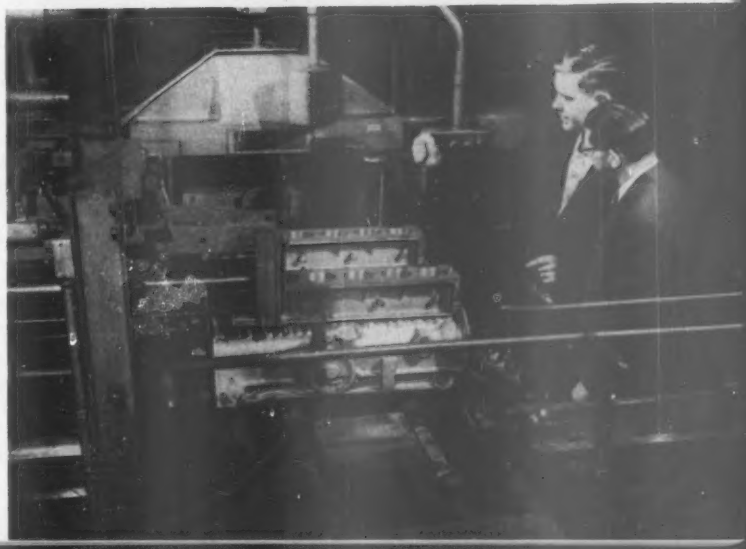
At present, rings are unpacked and loaded over storage tubes by hand. Next step will probably be hopper loading of the rings. But Ford is already figuring ahead to complete automation of this unique operation.

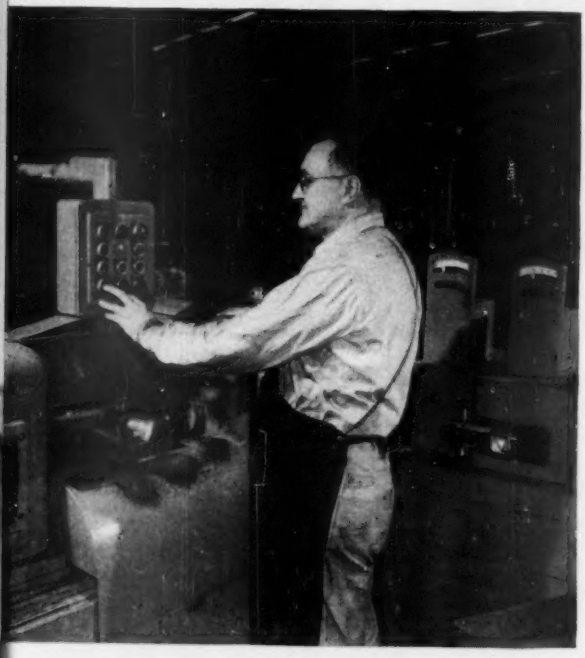


**DIVIDED HIGHWAY** in high-speed production flow requires traffic control—and automation provides it. The broach and spot mill in the preceding operations can work twice as fast as the end mill and boring machines. Here's how "selective automation" works:

Blocks move in lengthwise from the left. If the float for the mill shown is full (as it is in the picture), then the incoming block moves to the right to the next mill switchpoint. Should the floats be full at both mills, blocks continue to move until the switchtrack (right) and in-track (left) are full. At that point, the whole line stops, automatically.

*Turn the page*



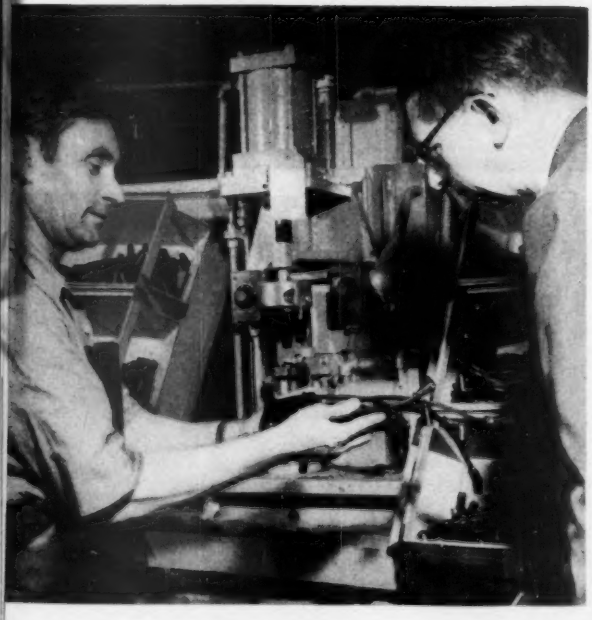


**A BUILT-IN MEMORY** is the key feature of this milling operation. The operator places a connecting rod-and-cap assembly on the scale at right while another rod is being milled at left. The scale weighs each end of the rod, remembers its total weight, and finds end balances.

Then a selsyn within the scale unit signals its twin in the miller. The latter controls a drive motor which sets a control stop for each cutting head.

Next, the operator removes the milled rod, and transfers the other from the scale to the milling fixture. Steel probes "find" the ends of the rod and adjust the cutters to remove just the amount of metal indicated by the memory. The miller holds a tolerance of plus or minus 2 grams.

Several of these millers are now in use. But they are already being made obsolescent by designers working on a unit that will feed the scale and cutter by an indexing mechanism and also eject milled rods.



**NO AUTOMATION HERE** — and probably won't be for some time to come. Ford has studied designs for automatic machines for this distributor cap subassembly, but hasn't yet found one that will pay off.

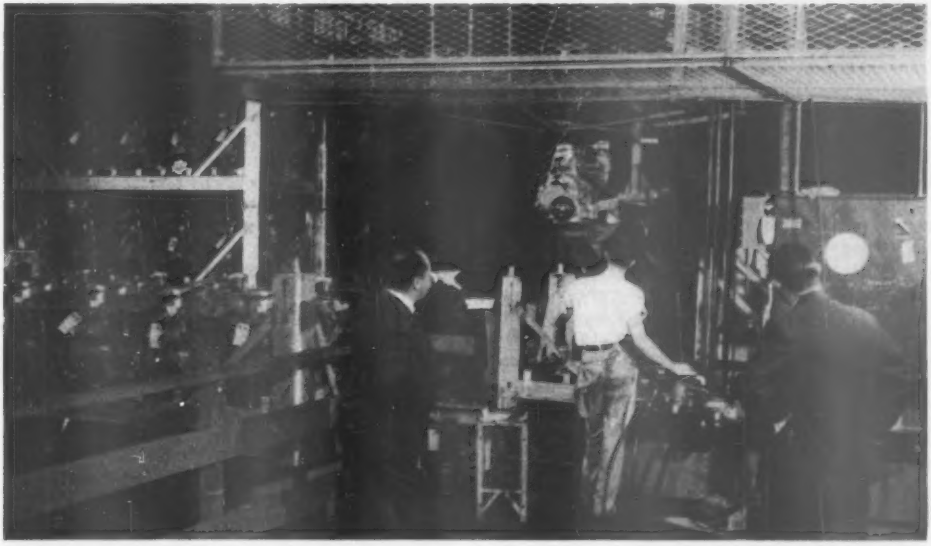
Seven metal-tipped cables are fitted with rubber hoods and pressed into the distributor cap by a small air press. Even though this is one of the least efficient operations in a highly automated plant, it's still a big advance over the previous all-manual method.

This assembly operation may look simple, but it's a tough nut to crack. So the next steps will most likely be such improvements as hopper feed, etc., rather than real automation.

**ENGINES ARE TESTED** as well as assembled in mid-air. Carriers move on a power-and-free conveyor (for complete description, see FACTORY, June 1949, p. 80).

Leaving assembly, the engines switch from the power conveyor and roll down a broad aisle between two banks of test stands. A "free" rail branches off the main line to each test stand. A key on the carrier switches it to the first open branch. Each free rail holds two engines—one on test, one ready for test.

Following test, engines move on and out of opposite sides of the test stand to a powered section of conveyor. By setting selector keys on the carriers, engines can be sent automatically to shipping dock, storage area, or adjustment area.



**ENGINES ARE LOADED FOR SHIPMENT** by a process that's nearly automatic, even if not automated in the full sense. From the power conveyor, high overhead, engine carriers are released to a free rail. On this, they roll to a hoist-mounted section or drop rail.

When the drop rail comes down, it places the engine directly in its cradle on the shipping rack. The rack is fed automatically to the point where the first engine to come down lands in the first cradle. As successive engines are lowered, the rack indexes forward so that each lands in its assigned cradle, until the five cradles on the rack are filled.

As each engine is cradled, two men remove the hanger bolts, and send the drop rail back up. The empty engine carrier then moves back to the power section of the overhead conveyor to go through the assembly cycle again, and the next completed engine moves onto the drop rail.

*Turn the page*

FORD'S AUTOMATED ENGINE PLANT

*Begins on page 93*

**When Charlie Winkelman toured Ford's automated Engine Plant, he noted some points on which he wanted more information. He didn't have time, after his tour, to get all the answers himself. So he turned his notes over to Bob Dilley, FACTORY's editor in Cleveland, who then spent several days talking with Ford's automation experts at Dearborn headquarters. Paraphrasing Winkelman's notes, Dilley brings you . . .**

# Answers to 13 Key Questions About Automation

## 1. Just what is it that distinguishes automation? How do you define it?

As Ford uses the word, automation is the "completely automatic (and selective) transfer of a part from one processing operation to another." The qualification "and selective" is important—it is often the distinguishing mark of automation. For example: The automatic-indexing, multiple-station machine tool does not, by itself, represent automation in the fullest sense of the word.

Automation includes both automatic unloading of one machine and automatic loading of the next. No human direction, handling, judgment, or assistance is needed to do these things.

At the same time, automation is more than just "hooking together" a lot of handling and positioning equipment. Automation devices are a distinct and superior order of materials handling equipment. They make full use of electrical memories and selector circuits. Ability to perform routine jobs of deductive reasoning is built into them.

As for the "mechanical activities" of automation devices, they can be designed to push, pull, grasp, lift, or lower parts, or turn them over.

## 2. What are the most important benefits of automation?

Ford cites six prime benefits:

**1. Automation pays for itself.** Ford found that its early automation installations paid off within a reasonable period. This initial success encouraged Ford management and engineers to expand the program and to study the possibilities of automation on a plantwide basis. When construction of new plants was considered, designs were made to facilitate the utilization of the most modern automation equipment and methods of materials handling. However, even when an entire plant is considered for automation, each part to be made in the plant is carefully analyzed to determine whether its production process should be automated.

**2. Automation increases machine efficiency.** By keeping machines running at peak capacity—eliminating delays and shutdowns for feeding and removing materials—Ford has raised machine tool efficiency from its usual 75%-80% to as much as 90%. And automation makes it possible to keep up with the higher feeds and speeds and metal-removal rates now available to industry.

**3. Automation conserves manpower.** Muscle power is little used in an automated plant. But that doesn't mean a plant without people. Instead of muscles alone, you'll need brains and skill as well —and, as a result, employees' jobs will be more interesting.

**4. Automation improves quality.** An automation device doesn't drop or fumble parts, and there's no variation in its performance. You spot a part precisely where you want it—undamaged. And you have far greater opportunity for "building inspection into the process."

**5. Automation increases safety.** Fewer people handle parts or work close to production equipment, so there's less chance of violent injury. And the chance of strains almost vanishes—all heavy moving and lifting is automatic. Fatigue, too, is greatly reduced.

**6. Automation reduces in-process inventories.**

Complete automation forces continuous movement of all materials. Nothing is stored or warehoused. You don't need big inventories.

## 3. What can be automated — economically?

Almost any operation. As a general rule, the number of manual operations in a process is the key to its *economic* automation. Ford happens to have automated high-volume operations. But it thinks the test of cost-per-piece with and without automation is the true measure of which operations to automate. Therefore, even low-production operations may prove lucrative fields for automation.

A job shop that ships literally hundreds of different items may have a few operations common to enough of the different items to make for high volume *at those points.*

*You don't have to automate a whole plant.* You can automate a department, a sequence of operations, or even a single operation. In most cases, volume of operations will dictate the scope of automation. Just *how* high volume must be to justify automation wil have to be determined for each potential application.

**Don't let Ford's highly refined automation scare you!** To paraphrase a Ford automation engineer, if you made mousetraps, you could automate with stuff from your scrap heap—in your basement—on rainy days. Ford just tackles automation, as it tackles other things, in a big way—because it's a big, high-volume producer.

## 4. How does a company organize for automation?

Before you start to set up an organization, make sure you have this prerequisite:

**You need religion—the gee-whiz kind.** You've got to want, as a company, to automate. Ford is doing it for competitive reasons as well as the others mentioned. Maybe somebody at the top in your company says, "It shall be done." Or maybe the methods or industrial engineering department sells it up the line. But first you must be *really* anxious for it. And it must have the complete understanding, backing, and enthusiasm of the top management people in your company.

If you pass that test 100%, then you start by fitting your new automation department into your existing organization.

**In most companies, several engineering groups will be concerned.** At Ford four such groups coordinate their thinking to develop automation. All come under manufacturing engineering. They are machine processing, tool design, special machines and automation, plant layout and equipment.

**How many men does it take?** From an original nucleus of five men, Ford's automation program has grown until at present there are many groups in the various divisions of the company, each working on its own automation program.

This view of Ford's automation growth points up a fact concerning your own automation organization. Better start it as a separate function or department under your manufacturing vice president or superintendent. Or under someone, at least, who can build teamwork among your engineers.

**If yours is a small company,** simply tailor the automation organization to your size.

**If you have multi-plant operations,** your automation section is probably best set up at the staff level. There it can benefit all operations and offer consulting services to branch operating men.

Best way to work automation into branch plants, Ford has found, is to automate key operations in each plant — and then let automation sell itself. Operating people see it work. And cost reports show them how it cuts costs.

## 5. What engineering skills are needed to automate?

**You should have competent senior engineers** — men who know tool and machine design. Automation is as much a problem of tooling as of materials handling.

**You need engineers who think of all the ways you can automate, not why you can't automate.** They must have curiosity and imagination as well as technical design skill.

Most important — they must be able to view the objective and work toward it. That sounds idealistic, but it's coldly realistic.

Take the new Engine Plant. Ford engineers started with the objective of a highly automated plant. Then, working backwards as it were, they called for unique machine tool designs and developed automation devices to tie them together. As a result, the block machining line is practically one vast machine tool, 1545 feet long and occupying 46,200 square feet — more than an acre! Actually 44 automatic machine tools and 80 automation units are involved. In all, it performs 530 cutting and drilling operations on each casting.

**You'll need a first-class electrical engineer.** Ford thinks a new breed of electrical engineer is needed. Key automation men can't define his abilities exactly, but in addition to the usual technical competence he must be able to design simple but adequately interlocked circuits. He'll have to integrate machine circuits with automation control circuits to assure safe, maintenance-free operation. *Turn the page*

## 6. How does a company start to automate?

Whether you want to automate a couple of operations, a line, a department, or a whole plant, your approach is the same.

**Make preliminary plans and sketches, or at least operation descriptions.**

**Have estimators get costs.** Your sketches and descriptions, in particular, will have to be complete enough for estimators to figure costs.

Ford always bounces automation costs against the cost of doing a job conventionally. Your cost estimates should be based primarily on man-hour savings at some reliable figure — whatever your average labor cost would be on a conventional operation.

Don't neglect, however, to include due allowance for engineering costs, some delays, increased maintenance costs, and higher individual skills needed to operate automation equipment. Also, keep detailed cost records you can refer to as time passes to set up budgets for your automated lines and operations.

Naturally, if you start with a few operations, your costs and problems will be relatively small.

**Figure on reasonable pay-off.** Calculate man-hours with and without automation. If your figures are accurate and show a pay-off period of about a year, don't hesitate to try automation. Now that Ford has gained confidence in automation, it is satisfied if the increased productivity pays off its cost in three or four years. Ford knows there are other cost-saving benefits just as important as man-hours.

**Restudy your automation designs.** Go over your power supply — that is, the power that moves the parts in process. Do you want gravity, air, hydraulic, or electrical power?

Ford uses air. Matter of fact, in its Engine Plant it has standardized on air power. Response to limit switch tripping is fast and positive. Parts in process can be moved at reasonable speeds. Air cylinders and allied equipment are reliable. And the air distribution system is relatively simple to understand and maintain. Any trained air-systems service man can keep it in order.

**Ford's experience indicates that air will move a big variety of part shapes and sizes.** Even block castings weighing 180 pounds are moved by air with precision.

Mushroom-shaped limit-switch trips are used whenever applicable at Ford's Engine Plant. They're durable and positive in action.

Ford's power circuits work like this: When the mushroom trip is depressed, it operates its switch. And when the proper switches are tripped, a given set of electrical conditions is obtained.

Then relays, energized by limit switches, operate solenoid-type air-control valves. These in turn operate the prime movers. Time lag between trip and cylinder motion in such a typical circuit is less than a second.

## 7. How much pre-planning and pre-testing of automation devices is necessary?

If your automation devices appear complicated, make some inexpensive models. Wooden ones will do. Or plastic. Make them full size and test them with the actual parts you intend to pass through the automated operations.

Your designers probably will have done an excellent theoretical job. But when you pre-test it, you'll doubtless find bugs to correct, so investment in a working model (or models) will save you time and money in the end. In pre-testing, be sure to check tolerances, clearances, gates, switch locations, trip locations, power unit operation, wiring, piping, clamps, etc.

**Remember, too, that automation equipment takes up floor space.** So you want it compact — and consistent with maintenance requirements and common sense.

Be sure you can cycle all automation equipment manually from control panels. No machinery is infallible, so design your equipment in a way that permits men to move parts through a temporary bottleneck by hand.

## 8. How much standardization is necessary for automation?

Working height of production equipment and automation devices is important. The "working plane" for heavy or bulky parts should be at a uniform elevation for top efficiency.

**Ford engine blocks, move at a uniform height through the machining process** — 40 inches above the floor. The slides they move on, as well as the load and unload stations on all equipment, are 40 inches from the floor.

It took some real engineering. But Ford feels it's important not to waste money on equipment to carry parts up and down or in any direction save straight ahead in the one designated "working plane."

Few of your own production machines can be adapted readily to this absolute straight-line flow.

But once you standardize on a working plane and all your equipment is of uniform working height, effective layout changes are possible. In the end, you buy layout and handling flexibility.

**Just the opposite is true, however, in production of smaller parts.** In Ford's piston line, the pistons travel up, down, and around turns.

And automated lines for making camshafts, tappets, ring gears, springs, and generator shafts, to name a few, include many working heights to utilize gravity and hoppers.

**Try to standardize on automation equipment design.** Simplified design lessens, whereas haphazard design increases, the variety of parts.

Purchase and installation of standardized parts will be easier. So will maintenance.

Of course, it's fair to ask what to standardize on, but your machine and tool designers will have to decide as their design progresses.

**Perhaps you'll follow Ford's example and experience by keeping standardization a key objective.** Automation could be a fool's paradise without standardization. So 95% of all the limit switches used in the Cleveland Engine Plant, for instance, came from one supplier.

## 9. To what extent can standard handling equipment be used for automation?

**Dismiss any ideas that standard materials handling equipment can be adapted easily to automation.** After more than five years of study, Ford's materials handling engineers think your chances of adapting today's equipment are slim, indeed.

Belt, apron, and plate conveyors offer some hope. But automation equipment does much more than convey. It physically ties two producing machines together, and automatically and completely handles the material between them.

Truly, little materials handling equipment available today comes even close to being suitable for automation.

## 10. How and where do you get automation equipment?

You'll probably have problems getting what you want. Practically no one in the country makes automation equipment as such. You really have two choices:

**You must build it yourself or have some specialty machine company build it for you.** If you have extensive metal fabricating facilities available for assignment to the job and you're starting on a small scale, it may be easier in the long run to build it yourself.

Ford's suggestion is that, ideally, an outside automation equipment supplier should be responsible for final design, fabrication, installation, and delivery of a working unit.

You give him your preliminary designs and offer him liaison as needed. You check his final designs. But try to keep fabrication out of your own plant. Otherwise there is a tendency to adopt too many changes, with the possibility of losing some of the value in the original specifications.

Since any machinery fabricator is also a potential maker of automation equipment, it might pay to discuss your needs with the manufacturers of the best producing equipment in your own industry —some company that's proved itself in machine design.

## 11. What influence does automation have on production equipment?

At the start, you may be inclined to want to hitch this super-handling equipment to the regular production machines in your plant. Maybe you can.

The standardization mentioned a few paragraphs above needn't keep you from automating. Ford has automated a lot of operations using standard machines not especially designed for automation. If a standard machine can be automated, then it should be used.

But remember, you've got to be able to tie each end of the machine to a piece of automation equipment, so that parts in process flow straight through machines and succeeding operations without manual loading or unloading.

**Furthermore, you'll have to encourage equipment suppliers to "think electrical."** Be sure to specify electrical controls in all cases. You don't want mere pushbuttons for manual control, or pilot-operated valves, or standard air or hydraulic controls. You want automatic production equipment with electrical controls.

And since electrical switches are precision instruments, suppliers should mount them in protected places — but accessible for maintenance.

Up to now, incidentally, Ford has stuck to electrical controls and tried to stay away from electronic controls of any kind.

Each machinery maker has his own ideas about how his equipment should be loaded and unloaded. You are faced, therefore, with this dilemma: Your old equipment probably won't do. And you may have a difficult time persuading machinery makers to produce the unusual kind of equipment you want.

But the problem is getting easier all the time. As more companies automate, suppliers gain confidence in their ability to produce the needed equipment. And experience with automation equip-

ment helps to break down old prejudices against such newfangled ideas.

**Procuring miscellaneous items.** Try to buy standard items of miscellaneous equipment for your automation devices. And be sure your fabricator uses them if he does the final designing.

Make it a point, say Ford's circuit designers, not to design your own special electrical components. If what you need isn't available (chances are it will be), ask an electrical manufacturer for help.

Because electrical circuits are the key to automation, buy standard items proved in service and easy to maintain. When you tie 15, 20, or more machines together with automation, any shutdown becomes a menacing bottleneck.

## 12. How is automation equipment installed and maintained?

Ford's experience shows that your purchase agreements should specify that the vendor install the equipment. Furthermore, if it's production equipment, you want it cycled and its output inspected — as is customary good practice.

You'll also want automation devices cycled, along with production equipment. Your key designers should be on hand to check installation progress and initial operation.

**Ideally, when you automate, your entire line should be laid out precisely** — to a fraction of an inch. (This was especially true on Ford's block and cylinder head lines. But on smaller parts, moved by conveyors and chutes, you have more latitude.) Just conveying a part close enough for a man to grab it and load it won't do. Your layout engineers, then, share a big part of the burden of making automation work. They'll be vitally interested in machine dimensions, heights, and load and unload stations.

And they'll be wise to insist that all equipment be built over certified prints. Naturally, your layout men will supervise all equipment installation.

**Machinery bases must be installed and ready for equipment.** Plant services needed at the automated operations must be installed and checked early. If wastes are byproducts of automated operations, they will have to be removed — probably automatically.

**Your electrical design engineers must supervise testing** and be on hand if difficulties are encountered. As installation moved along at the Ford Engine Plant it sounded as though Swiss bell ringers had moved in. Electricians tested all machine and automation circuits by the simple technique of ringing bells.

## 13. What type of training is needed for employees?

For the most part, training breaks down into two kinds — production and maintenance.

**Production workers must be taught how to operate automated lines.** Standard machinery operation instruction can be used. Often it's wise to have equipment vendors' representatives on hand to give step-by-step training to both production and maintenance employees. Actual demonstrations of the cycling machines and automation devices are essential.

Otherwise, automation brings little else that's new to production work. Your skilled people, of course, are assigned to automated lines according to their skills.

**Maintenance training is a little more involved.** One reason Ford stuck to electrical rather than electronic equipment was to eliminate any need for electronics specialists. Actually, good plant electricians can be trained as circuit technicians. The hardest training job, says Ford, is to make electricians aware of their mission—to keep the one big integrated automation circuit in mind at all times. On-the-job training is the best answer.

**Another training problem is to get electricians used to checking circuits at the panels.** Properly designed circuits can be checked right at the panels, but the average electrician wants to begin checking out on the line somewhere, at a great loss of time. Panel checking, Ford finds, is surer and faster.

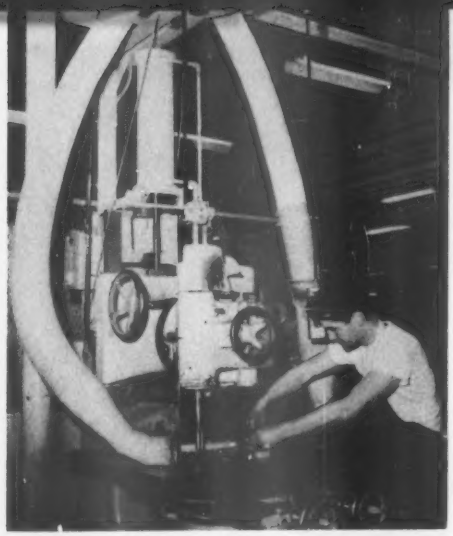
Supervising electricians, at least for a while, is a job for one or more of the electrical design men who worked on the automation from the start. They can quickly train electricians to handle circuits and then return to designing as operation picks up.

**You may also have trouble getting employees to accept "group replacement" of tools.** At Ford each machine with 40 or more spindles has its own tool board with cycle counters that keep a running record of tool use.

Generally, if a tool breaks or shows excessive wear and 85% of the expected life of the other tools is used, all tools are changed. When you consider the high cost of downtime on automated operations, this is the economical way to change tools. But you're likely to find resistance to this "tool-wasting" procedure among some employees — and perhaps among some "production-minded" supervisors.

**The other spot where you'll need to enlarge your training is among millwrights and riggers.** If you go in for automation on more than a limited scale, you'll require more of them — with more skill — than ever before.

# Air "Laundry" Will Pay for Itself in 3 Years

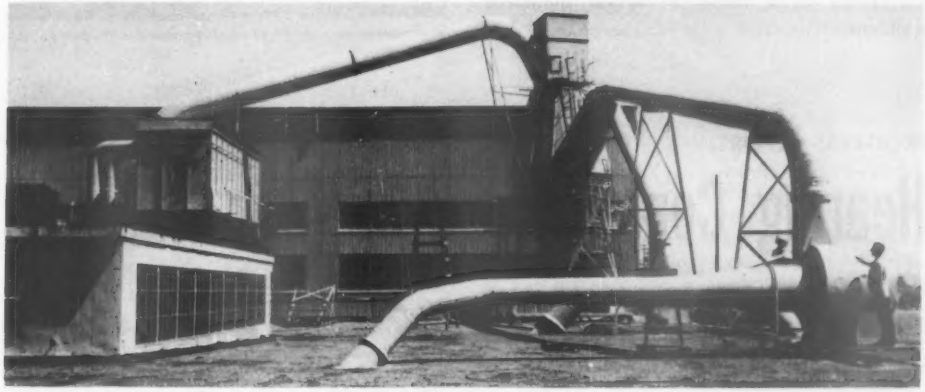


Warm air sucked from around machines . . .

IT DOESN'T SCRUB SHIRTS AND SOCKS, this "laundry" that serves the wood and pattern shops at Boeing Airplane Company, Seattle. It cleanses warm air.

And it lets Boeing recirculate air that was previously exhausted from the building. Plant Engineer Bert Axman expects the $15,000 installation to slice $5400 off his annual bill for steam heat. At that rate, it'll pay for itself in three years.

Formerly pipes sucked sawdust, shavings, and heated air from around machines to a cyclone-type dust collector on the plant roof. After debris was removed, the air was wasted.



. . . is piped to roof, cleaned by cyclone-type dust collector (right) and air "laundry" (left) . . .

. . . then vented back into Boeing plant

Now the heated air also goes through a second cleaning device, which extracts all remaining dust particles and collects them in bags. When the system shuts down—at noon, for instance—the bags are automatically shaken and emptied.

Clean air is returned to the plant at 40,000 cfm. and 70F. The return point—near an outside door—has a steam coil heater. In cold weather, opening the door turns on the heater. This raises the air temperature to 150F., forming a protective curtain inside the door and keeping the interior comfortable.

On cold days, Boeing's new system saves about 2400 pounds of steam an hour, says Axman. When warm air isn't needed, it's vented outside the plant.

*Editor's Note:* **Industrial deafness is a big problem, potentially costly. Yet little has been done about preventing it, because to date little authoritative data is available on what to do about it.**

**• This article isn't designed to give you all answers to the problem—or the formula for preventing industrial deafness. That's something that may be a long way off because the basic research needed is a slow job.**

**• But what Allis-Chalmers is doing is a real step forward. This company's experience to date should help you get started on a similar program—and should add to the growing fund of knowledge on a vitally important industrial problem.**

**A HEARING TEST** is given each new employee at Allis-Chalmers as a routine part of the physical examination. Audiometer test

PROGRESS REPORT:

# Hearing Conservation at Allis-Chalmers

By M. F. BIANCARDI • Manager, Health and Safety Department, and DR. PAUL J. WHITAKER • Medical Director, Allis-Chalmers Manufacturing Company, W. Allis, Wis.

BACK IN 1948, we first became aware of the importance of the problem of industrial hearing loss. We began then the first stumbling steps towards our present hearing conservation program. Finally, in December 1951, a formal program of audiometric (hearing) tests for all new employees was started. Periodic checking of old employees in some occupational groups is also under way. We plan to check all employees at the time of their periodic vision tests.

Our main purpose in establishing the program:

1. From a humanitarian point of view, we wanted to prevent industrial hearing loss among our employees as part of our effort to protect the worker's physical well-being.

2. From an economic point of view, we wanted to reduce the number of future compensation claims and also collect data to fairly appraise claims based on past exposure.

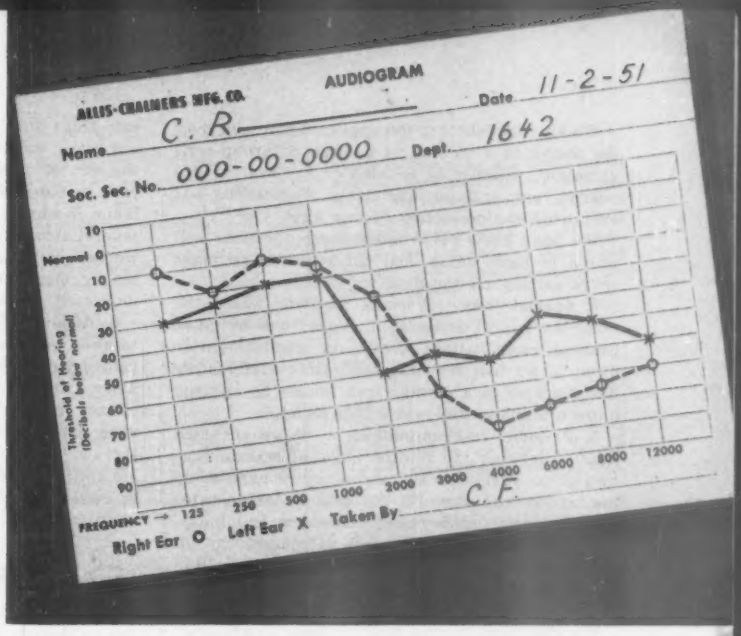
3. From a scientific point of view, we wanted to add to the research data of scientific and medical organizations which are attempting to establish standards for industry's attack on the problem. (For this reason we submit our data to the Sub-Committee of Noise in Industry of the Committee on Conservation of Hearing of the American Academy of Ophthalmology and Otolaryngology.)

Although we know there will be humanitarian benefits, we cannot as yet point to any dollar-and-cents benefits. But we do know now that *27% of the people who apply to us for jobs have some hearing loss.* That fact alone, we feel, is enough to justify the expense.

## How we got started

We were made sharply aware of the problem in 1948 by the late Dr. W. E. Grove, a pioneer in studies of industrial deafness. As a result, we reviewed all available data—of which there was very, very little—on noise abatement and hearing

is given in a special room by company-trained technician. Noise level is low and constant.




**POOR HEARING** at middle and high frequencies shows up frequently among incoming employees. It means giving special consideration to the placement of such a person.

loss due to noise. We began familiarizing ourselves with the three basic instruments we'd have to use: the audiometer, the octave band analyzer, and the sound level meter.

**Hearing tests** · W. F. Scholtz, our supervisor of industrial hygiene, spent some time in Dr. Grove's office, learning to use the audiometer by giving hearing tests. Dr. Grove and several other doctors came to the plant in 1949 and made some preliminary noise-level studies in the shop.

In 1950 we purchased an audiometer and set up a preliminary testing program. The people in the industrial relations division were used as guinea pigs. By the middle of 1951, audiometer tests were part of the routine physical examination of all incoming employees.

**Noise surveys** · In the meantime, using the sound level indicator, we made over-all sound-level readings in all of our plants. The purpose of these surveys: to find locations where the noise level is more or less continuously high.

These studies, of course, will enable us to check the studies of hearing loss of an employee against the noise level of his job location. We want to find out what sound levels a worker can safely be exposed to.

This information is particularly helpful in carrying out a noise abatement program. As we take steps to reduce the noise, follow-up readings will tell us to what extent we've succeeded. Of course, when any changes are made—adding, removing, or repairing equipment—we will make resurveys.

## Where we now stand

We first formally notified workers of the hearing conservation program in the December 12, 1951, issue of our employee publication, *A-C Views*. Foremen and the union got advance notice and educational background in regular safety meetings.

Top management, of course, had approved the program in general from the start. And the details of the program were approved by the Works Safety Council, consisting of the four works managers in the plant, the assistant director of industrial relations, the medical director, the manager of buildings and properties, and the manager of the health and safety department.

Immediately after notifying the workers, we set up the following schedule of tests:

**1. Pre-employment tests** · All new employees are given a hearing test as part of the routine preplacement examination. This examination does not affect our decision to hire the applicant. A man with a hearing loss is placed on a job in which his loss is not a serious drawback.

We feel it is important to record a lot of background information. Age and occupation of the employee, for example. The previous work history is also important from the hearing-loss viewpoint. And the record should show the operations the applicant has been exposed to in the past. Did he work as a boilermaker—how long?—or spend his military life pulling the lanyard on a 105mm. howitzer?

*Turn the page*

We also ask whether the applicant can hear over the phone, in a theater, in a single or group conversation; whether he is using or has ever used a hearing aid, and for how long; whether he has ever used ear protection of any kind.

We don't know yet whether these questions will prove to have value. But for research purposes we're getting all the data we can.

**2. Special tests** · Workers in areas where the noise level is 90 decibels* or higher will be given hearing examinations every six months — more often if we feel it's necessary. Of course, as we find workers in a certain area should be checked more often, we will revise this schedule.

**3. Periodic re-examinations** · We've included hearing tests in the routine physical re-examination given yearly to all men who are exposed to hazards or who work off the ground. Welders, for example, and foundrymen, cranemen, and maintenance men. Since a year has not passed, not all of these men have yet been tested, but we're calling them in whenever the facilities for testing are available.

We also plan to give hearing tests to all other employees, including office employees and salaried personnel. At least as a starting point, we're planning to repeat these tests every three years. If this sounds infrequent, remember that all employees exposed to any appreciable volume of noise will be tested more frequently, as outlined above. And also remember that the time schedules for the various groups can only be tentative.

## How we're using results

If, on recheck, an employee shows a significant loss of hearing, some action has to be taken. There are three possibilities: (1) reducing the noise at that job location; (2) providing some sort of ear protection for the employee; and (3) transferring the employee to a less noisy job.

**1. Noise abatement is still in the early stages of development.** Some progress has, of course, been made. The noise of some operations can be controlled to a degree through the use of rubber mountings, enclosing the operation, and using acoustical materials—sound absorbing board and cones, sound reflectors, etc. Keeping machinery oiled and well maintained will sometimes reduce noise to a surprising degree. But abatement, which attacks the cause instead of the effect, is not always a workable solution at present.

**2. Ear protection is — at least at present — the most workable solution.** Two types are available: ear plugs that fit into the ear (of which there are many varieties), and ear muffs, that fit over the ear. At present we use only ear plugs. Some care in the selection and fitting of plugs must be taken. We have the medical department do this, for several reasons: to get a good fit, to educate the worker in their proper use, and to help avoid among our men the common practices of using untreated cotton or other substitutes.

**3. Although job transfers are perhaps the first solution you'd think of,** they present a major difficulty. It is difficult to arrange a transfer to a less noisy job that the worker can handle, and that carries the same rate of pay. Industrial relations-wise, job transfers are simply undesirable. Further, at the present stage of medical knowledge, we are not at all sure that transfers are necessary or even indicated. They must, therefore, be looked upon as a last resort.

## How practical for others?

Can other plants do what we've been doing? Yes, although the actual procedure might vary from plant to plant, depending on number of employees, general noise level, and other local factors.

Plants interested in undertaking a program of hearing conservation need not spend a lot of money for equipment unless the size of plant or type of program makes having their own equipment desirable and economical. Many local doctors are equipped to make hearing tests. Arrangements can be made for tests to be given in a doctor's office, or for a doctor to visit the plant on a part-time basis to give the tests. Sound-level studies are being made either free or at nominal cost by many insurance companies and state boards of health. Many industrial hygiene consultants can make these studies.

We, of course, are making our own tests and studies. We have set up an audiometer room, as a part of the first aid facilities. The room was designed to provide a fairly constant noise level of less than 50 decibels. This is necessary to insure accurate and consistent audiograms.

We've also found it practical to train our own audiometer technicians. This training was given by our medical department. The training included a simplified description of what noise is, how it is measured and evaluated. Then the use of the audiometer was demonstrated. The trainees were given an opportunity to practice using the audiometer by taking tests of medical department personnel. Operators follow a written "flow sheet," outlining each step in the procedure.

After these trial runs, the operators were permitted to make audiometric examinations under close supervision of our medical director. And eventually they were turned loose. It should be emphasized, however, that interpretation of the results is a job for an expert.

* We should like to emphasize that this figure of 90 decibels is by no means established as the sound level above which workers cannot safely be exposed. It is merely a figure tentatively established by our medical department, in the absence of substantiating data, as a level where it was felt it would be desirable to study possible audiometric changes among our employees.

| OPERATION | | DATE | OBSERVER | |
|---|---|---|---|---|
| OPERATOR* | ACTIVITY* | PERFORMANCE RATING | TIME | LOCATION OF ACTIVITY* |
| E | 4 | 95 | 8:10 | 3 |
| A | 2 | 80 | 8:13 | 1 |
| D | 9 | 90 | 8:19 | 2 |

*Predetermined codes save writing out the operator's name, detail of work being performed, and the area in which he is doing the work. The elements of activity for a materials handling study might include: check reports with material; operate fork lift truck; move material manually; idle time; and others.

## Make random observations of operators' work...

| DATE | ACTIVITIES | | | TOTAL | | | ACTUAL HOURS OF GROUP | STANDARD HOURS |
|---|---|---|---|---|---|---|---|---|
| | ACTUAL | RATED | RATIO | ACTUAL | RATED | PERFORMANCE | | |
| 8/18 | 5 | 4.90 | .30 | 20 | 16.2 | 81.0 | 24 | 19.4 |
| 8/19 | 6 | 5.22 | .30 | 20 | 17.6 | 88.0 | 24 | 21.1 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**ACTUAL** • Number of observations.

**RATED** • Number of observations multiplied by performance rating of each.

**RATIO** • The ratio of "rated" of each activity to total "rated." Here it's 4.90 ÷ 16.2 and 5.22 ÷ 17.6. This ratio represents the proportionate time required to perform an activty in relation to the total work done. Idle time and avoidable delays are rated zero.

**PERFORMANCE** • Rated observations divided by the actual observations.

**STANDARD HOURS** • Actual hours times the performance.

## ...then summarize the results.

You can use work sampling this way to

# Measure Indirect Work for Cost Control

By CHARLES A. BOGENRIEF • Department Head
Industrial Engineering, Grayson Controls Division
Robertshaw-Fulton Controls Company
Lynwood, Calif.

**The author has adapted the ratio-delay form of work sampling to measure indirect work—materials handling and other service jobs. Measurement provides a factual basis for cost control standards. For a complete explanation of work sampling—the new way to get all the facts you need to cut costs—see FACTORY, July 1952.**

NOT MANY COMPANIES APPLY work measurement to indirect work, even to set standards for cost control. There are several reasons, but probably most often heard is that too much time and manpower are required to time-study the non-repetitive, variable, indirect operations. Building the standard data required to measure this type of work is slow and discouraging.

We've found that ratio-delay studies give the data to set standards with only a quarter to a third of the time required by time study. Of course, with a limited number of observations standards are not as accurate as time study standards, probably not good enough for wage incentives. But they can be about as accurate as you need them. Certainly they're good enough to use as standards for cost control—much better than "guestimates" for that purpose.

Preparation for our indirect studies is pretty much the same as described in the July 1952 is-

sue of FACTORY (page 83). The forms shown (page 113) illustrate the way we take our studies and summarize them.

In addition, our experience has shown us some rules of procedure I'd like to pass along. Here they are:

• **Accuracy.** Give some thought to the accuracy required in planning the study. Be sure your observations are a random sampling. Get enough readings. Make the study over a long enough period to get a thorough sampling of the non-repetitive and variable conditions. The more non-repetitive the operation, the more observations you need.

• **Work area.** Divide the plant or department into areas where the indirect work is performed. That will help you decide where to study first—where more man-hours are spent. Also, it will help you set standards in relation to production or direct labor hours within a given area of your plant.

• **Performance rating.** If you want to add performance of the operator to the observation of what he's doing on each sample, you'll have to use experienced time study men to do the job. But we've found it's necessary to do this if you want reasonably accurate work measurement. Make the rating simultaneous with the observation or the operator may change his pace. Setting the point of observation at some distance from the operation makes it easier to get a random, unaffected picture. I don't mean that you should observe from behind columns. We just don't do that.

• **Summaries.** There's a wealth of information in the studies. You may summarize it in several ways to analyze the work—by areas, variety of work, and so on. To set standards you'll want to summarize the studies in relation to units of work measurement, factors that determine the amount of indirect work required.

• **Standards.** With the study data you can set standards just as you would with time study data. Calculate standard hours earned by ratio and relate them to the units of work measurement for the same period.

**LIMITATIONS** · We don't recommend this type of standard for wage incentives. We use ratio-delay standards for cost control of group activities.

Don't reach for too much detail in your breakdown of work. Use broader elements of the operation than you would with time study.

# 'Twas the afternoon before Christmas and...

BY RAY W. SHERMAN

WITH DUFF BELLAIRE PRESIDING, the foremen's meeting plowed through what the "brass" called "the agenda" and foremen called "the stuff."

Finally, with only one slip of paper left on the lectern in Central Manufacturing's snazzy auditorium, the stocky chairman picked it up and said:

"And now, gentlemen—Merry Christmas—from your old friend, one Tobias Quint, plant manager of Central Manufacturing."

Mort McCann, new foreman in B-L after 17 years of working up to the job, perked up. Maybe he was going to get another raise. A second look at Duff's face told him he wasn't.

From their comfortable seats, ample for the most

expansive fundament, the gang watch their chairman, whose rotund cheeks puffed as though about to explode a sensation.

"Merry Christmas to Toby," said a voice.

"OK, Duff!" Impatience tinged another voice. "Let's have it!"

"Well—" Duff held up the slip "— it says 'what to do about afternoon before Christmas.' "

"I'll bite," said Red Kane, veteran foreman of H-V, who was one of the first the Old Man hired when he started the business. "What do we do? Sing carols? Who's going to play the piano?"

Duff pretended he hadn't heard. "What's on Mister Quint's mind is this before-Christmas party stuff—with liquor."

"Swell!" came from off at the left. "Make mine bourbon on the rocks!"

"Don't be silly!" Duff glowered. "What Quint wants to know is how we *don't* have any liquor."

The bourbon man groaned aloud.

"Let's get down to cases!" snapped Duff. "I thought he'd show up. He said he might." Duff looked hopefully toward the entrance, not knowing the plant manager had no intention of coming.

"You know—men like to celebrate—"

"What does he want us to do?" a voice demanded.

"Well—he'd like there not to be any liquor."

"So-o-o?" drawled a foreman at deep right.

"It's not up to me," said Duff. "I'm only one foreman. What do the rest—"

From the front right corner came a rumble, like far-off thunder, rolling in long deep notes. They all knew who it was. Only Tom Callahan, foreman of M-T, and veteran from the plant's baby days, could sound like that.

"A man shouldn't get drunk on Christmas Eve." That's all Tom said.

It was the better part of a minute before the "So-o-o?" let loose again.

Duff worked his lips. Scanned the crowd. "There's a company rule," he said. "No liquor in the plant—except in First Aid—and you have to be awful sick to get any of that."

Voice: "I don't feel very well, Mr. Chairman."

"You know how it is," Duff went on. "Little parties get started, rules or no rules. Then somebody drinks too much. Gets messy. You know that."

"So-o-o?" There it was again.

Duff's face got pinker. He wished he'd read more carefully in that parliamentary book. It might tell what to do with a "So-o-o?" man. Then, to Duff's relief, Red Kane was facing the audience.

"Look, you guys!" Red snapped. "All this amounts to is that Toby is asking us foremen to see to it that there isn't any drinking in the plant the afternoon before Christmas. Anything complicated about that?" Red sat down, in quite a lot of silence.

Before the "So-o-o?" man could load his gun once more, Old Tom Callahan, grizzled and gray, was slowly coming up again. For a moment he just looked at them. Finally his grim lips parted and he rumbled:

"Before some of you were born—when the Old Man started this plant—he hired me—Red Kane—Toby Quint—Bill Carner—a few others. We didn't have plant parties then. We worked till six o'clock Christmas Eve. And went home.

"Since then hours have shortened. The plant has grown big. But—the fundamentals haven't changed. Neither has Christmas. Back in those days the Old Man used to say a man shouldn't get drunk on Christmas Eve. He said it was a children's day—in honor of a Child.

"He said there were young men in the plant who'd never drunk anything. And they weren't going to get their first drink in Central Manufacturing. There were older men who ordinarily would go home sober and enjoy the next morning with their children 'round a Christmas tree. He said Central Manufacturing wasn't going to start a single one of them on a Christmas binge.

"So, years ago, the Old Man said: 'No liquor in this plant on Christmas Eve.' Lately there have been slips. Toby or the Old Man can't handle it. They're passing the buck to us."

Old Tom's face set. He hesitated. "There hasn't been—and there isn't going to be—any liquor in my department. Every man in M-T will leave this plant cold sober."

Just before he sat down he rumbled: "A man shouldn't get drunk on Christmas Eve."

There wasn't even a "So-o-o?" Duff looked at his watch and tapped his gavel.

"Meeting adjourned," he said.

# IDEAS OF THE MONTH *for*

By LEWIS K. URQUHART • Managing Editor

**SAVE WORKERS' FINGERS** with those new ball-tip gloves (The Boss Mfg. Co., Kewanee, Ill.). Steel balls are securely stitched into the ends of the all-leather fingers, which are cut extra long to leave room for the wearer's fingers. Designed for handling heavy steel sheets and shapes, but obviously suited for any heavy handling job. Boss will take your order for a single pair so you can try 'em out.

**FOR TRAYS** that guarantee safe conduct for fragile precision parts, see those fabricated by Mercury Plastics, Springfield, Mass., of "Boltaron" (a high-impact, low-pressure, formable plastic sheet material developed by Bolta, Lawrence, Mass.)

**YOUR CHRISTMAS LIGHTING** problems can be readily solved by getting a 20-page booklet from Westinghouse Lighting Dept., Box 430, Bloomfield, N. J. It's called "63 Brilliant Ideas for Christmas Lighting."

**TECH-CLAMP** is a new quick-acting, adjustable vise for drilling, tapping, milling, reaming, grinding, etc. Cuts down set-up and clamping time. $14.75. Tech-Clamp Co., 177 State St., Boston 9.

**POLY-VINYL CONVEYOR BELTS** are for you if yours have to be clean and white. They resist dirt like anything. Belt pores are so minute they don't readily pick up dust. Main Belting Co., 1241 Carpenter St., Philadelphia 47.

**HALF A CAN OF PAINT** left over? Keep it fresh for months. All you do is stir in ½ ounce of Paint-Sav for each quart of paint, enamel, or varnish remaining. Ames Aromatics, Inc., 132 Water St., S. Norwalk, Conn.

**MELT** is good stuff to have in the bag—to handle your ice and snow melting problems this winter. And The Chem Industrial Co., 3784 Ridge Road, Brooklyn 9, Ohio, supplies it not only in 100-lb. moisture-proof bags, but also in 25-lb. steel pails and 100-lb. steel drums. A new anti-rust phosphate has been added to protect pipes, gutters, drains, etc.

**BOOKLET OF THE MONTH** is "430 Stainless Steel" (Sharon Steel Corp., Sharon, Pa.) because it bears down so heavily on the need to understand 430 before you decide to use it.

**HELICOPTER** provides fast inter-plant service for engineering and operating executives at Rockwell Mfg. Co. Lands 'em a few minutes from the factory door, not miles away. Ideal if, like Rockwell, your company has seven plants within a 200-mile radius.

**PAINT @ $75 A GALLON?** Yessir, it's DuPont's new "Teflon" polytetrafluoroethylene finish. Seems to be the cure—even at 29c per tbs.—for that tendency on the part of sticky substances like powdered soap, rubber, candy, and frozen food to cling to the smoothest metal surfaces.

# Factory Executives

**A NEW PLANT IN '53?** Better write Walter Kidde Constructors, Inc. (140 Cedar St., NYC), for a copy of "Factors Influencing Plant Expansion." Contains 64 questions to ask yourself when you pick the site.

**FLOWED-IN GASKET,** developed by Dewey & Almy Chemical Co., Cambridge, Mass., can be used wherever component parts require gaskets. A liquid synthetic rubber or resin compound is forced through a nozzle on a spinning part—and baked to form a solid rubberish gasket that won't fall off.

**PERMANENT MAGNETS** can be used all over the place. And now you can get an experimental kit from the Carboloy Dept. of General Electric Co., Detroit 32. Costs only $10. Contains 48 magnets in 8 styles.

**COFFEE CUB** is no bigger than an office-type water cooler. Serves 100 cups of coffee without refilling. For small plants and offices. Rudd-Melikian, Inc., 1949 N. Howard St., Philadelphia 22.

**NO WRINKLING, NO JOGGING, NO SOILED COPIES** when typists use the new "Motion-Economized" packets devised by Carbon Paper Pac Co., 210 S. Clinton St., Chicago 6. They contain up to nine carbons and can be loaded in advance—by the office boy.

**ROTARY CARD FILE** unveiled at the National Business Show by Mosler Safe Co., Hamilton, Ohio, is divided into 16 clearly identified, pushbutton-controlled sections. To find a card, the clerk touches the right button. The file revolves clockwise or counter-clockwise—depending on which direction will save more time.

**NO EAR PLUG,** says Sigma Engineering Co. (1491 N. Vine St., Los Angeles 28) of its new "Sonic Ear-Valv." It protects the ear from loud noise but lets air in—also ordinary voice-level sounds.

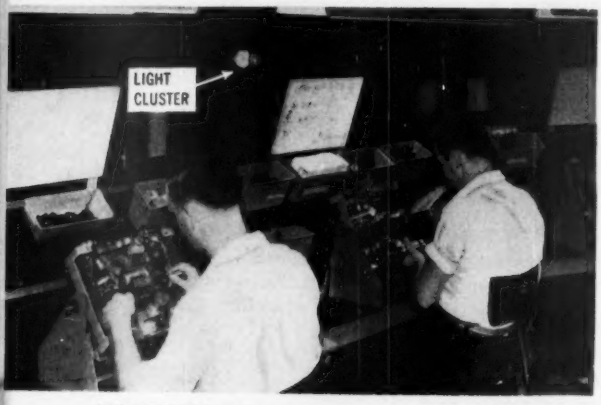
**LETTERS CAN HELP OR HURT** your company's reputation. So we recommend "Effective Business Letters," a 32-page handbook just published by General Foods Corp., 250 Park Ave., NYC 17. Send $1 for a sample copy—and 10 to 1 you'll want copies for other letter-writers in your organization. Special rates for bulk orders.

**TABLE-TOP COLLATOR** gathers papers in sets of 2 to 8 pages in one operation. Available in 5-bin or 8-bin models. Priced at less than $100. Thomas Mechanical Collator Corp., 30 Church St., NYC 7.

**10-POWER MAGNIFIER** is designed for on-the-job inspection. Can be clipped to your pocket like a fountain pen. Built-in light source. $7.50. Bausch & Lomb Optical Co., Rochester, N. Y.

**WRONG ADDRESS.** American Pencil Co. is in Hoboken, N. J. (not Newark, as stated in this department for November).

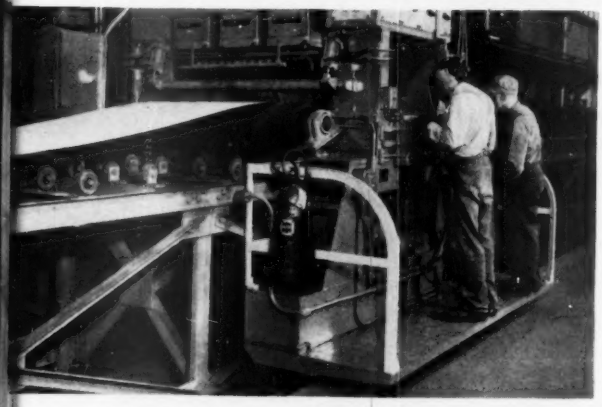
# OPERATING SHORTS




## Colored Lights Signal Output Quality

Clusters of three colored lights signal production quality to assemblers at the Chattanooga Works of the Western Union Telegraph Company. There's a green, yellow, and red cluster over each section of the Desk-Fax assembly line.

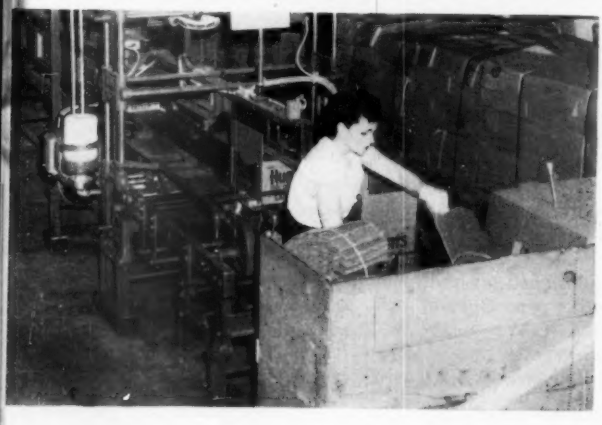
When quality is OK, the green light burns. When a tester finds a flaw, he pushes a button turning on a yellow light over the section at fault. If the section foreman can't spot the trouble immediately, he has the red light turned on at one or more sections. This stops output until the defective work is corrected.



## Traveling Welder Joins Moving Coils

This welder travels while it works at the Brackenridge, Pa., plant of Allegheny Ludlum Steel Corporation. It joins stainless steel coils into a continuous strip without checking their flow through the annealing and pickling line. The welder, a multiple-electrode type, is mounted on rails, moves with the moving strip.

Coil ends are self-centered and clamped down on each other. Electrodes are forced down on the strip and fired by a timing device. After a short hold-time, the strip is automatically released. A hydraulic unit actuates guides, clamps, and electrodes. Timing and sequencing are controlled electronically.



## Unbreakable Bottle Breaks Bottleneck

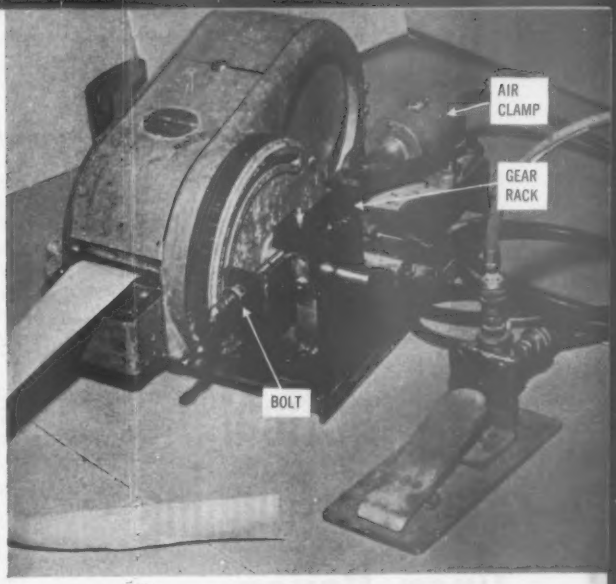
The glue feeder, a glass bottle, wasn't smashed often. But even occasional breakage was troublesome. It delayed production by the carton sealing machine at United Can & Glass Company, Hayward, Calif.

So the breakable glass glue feeder was replaced with an unbreakable plastic one. The 1-gal. polyethylene bottle is also lighter and easier to handle than the glass container. Blow-molded in one piece by Plax Corporation, it's translucent and shows the glue level. Mouth of the bottle can't be chipped, and its relatively soft material won't ridge a gasket.

## Air Power Dispenses Tape

An air-powered tape dispenser halves packing time at F. W. Wakefield Brass Company, Vermilion, Ohio. Converted from an ordinary, hand-operated dispenser, it moistens and ejects up to 34 inches of gummed tape at a time for sealing cartons.

To operate the machine, the packer trips a foot-controlled valve. An air clamp pushes forward a gear rack. The gear rack engages another gear on the drive shaft to eject the tape. An adjustable bolt controls tape length. While the tape is automatically dispensed, the packer folds the carton.

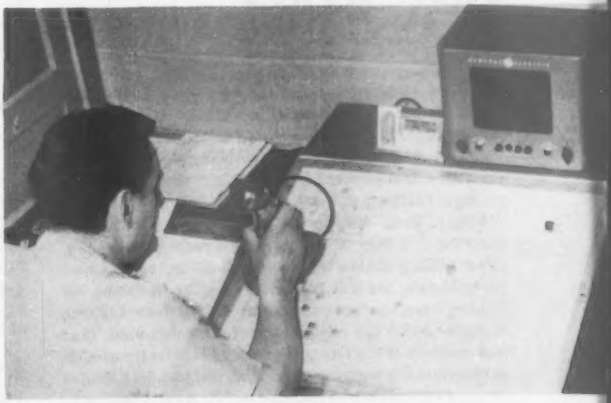



## Dispatcher Plots Lift Truck Moves

This dispatcher can always put his finger, figuratively speaking, on each radio-equipped lift truck at Electric Storage Battery Company's 19-acre plant outside Philadelphia.

He talks with the 11 roving trucks by 2-way radio, keeps track of their movements with small magnetic blocks on a plant layout drawing. When an emergency job pops up, he knows at a glance which truck to assign.

Improved control of trucks has cut confusion, reduced supervisory costs, and taken up much of the slack time in materials handling. General Electric Company supplied the radio-telephone equipment.

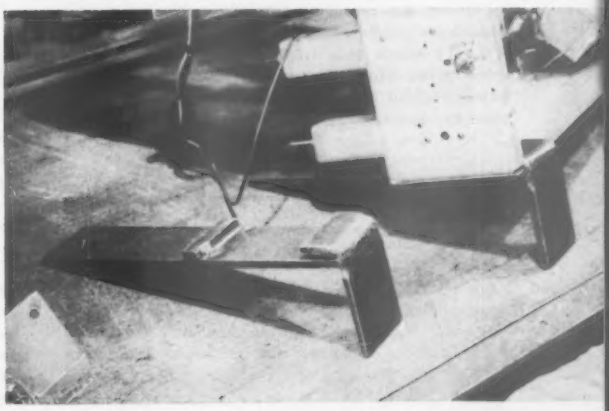


## Tilted Assembly Easier to Work On

These strap iron fixtures hold a television receiver chassis on a tilt on a conveyor line. Here's how they were made in the Cincinnati plant of the Crosley Division, Avco Manufacturing Corporation:

Each iron strap was bent at a right angle. A chassis-gripping lip was welded to the bend. A metal stop was welded in position halfway down the slope.

The chassis is tilted at the best possible angle for final wiring. It can't slide out unless it's first lifted up.



# 10 Practical Tips on Running Open House

*If you're thinking of running an open house program for your plant, you'll get plenty of help from these tips. They take you "on the inside," give you a picture of some of the savvy things you ought to consider—things that often aren't thought of till you're well along in your plans.*

*These ideas are drawn from the experience of the Chase Brass & Copper Company, Waterbury, Conn. When Chase decided to hold an open house to celebrate its 75th anniversary, it did not, of course, have to start from scratch. Its first step was to survey the experiences of other companies that had conducted similar programs. The results of this survey work were good, and materially helped Chase to conduct a thoroughly successful open house program in its own community. But, as often happens, no survey can reveal all the information that later experience shows would have been helpful.*

*That's where this article comes in. It supplies some of the information you might not think of inquiring about at the time—but which will help plenty if you have it in advance.*

**1. SET YOUR BUDGET REALISTICALLY** • You can't be too careful on this. Decide first just how complete and elaborate you will be. Then really pulverize the costs, estimating on the basis of first-hand checks into sources of supply and quoted figures. Chase's first budget took two full pages just to summarize main cost categories. Final costs ran to about 90 cents per visitor. Here's how the Chase budget lined up:

| | |
|---|---|
| Food | 20% |
| Transportation | 8% |
| Souvenir booklet | 14% |
| Signs, letters, etc. | 14% |
| Plant protection, personnel, overtime | 21% |
| Miscellaneous | 23% |
| Total | 100% |

**2. TAKE YOUR OWN MEDICINE FIRST** • By having a group of its own executives act as "guinea pigs," who took the tour away ahead of time, Chase spotted a lot of little things that might have caused trouble later. For example, safety hazards that might go unnoticed by one or two men are sure to be spotted by some member of a guinea-pig group. And details of the flow of traffic can be subjected to eagle-eyed scrutiny, to avoid last-minute bottlenecks.

**3. PLAN ON AN EMERGENCY HEADQUARTERS** • Sounds like a simple point. But it's reassuring to know there's a central spot headed up by someone who can act fast to meet emergencies.

*Another hint:* Don't load your headquarters with minor problems. Give men right on the scene enough authority to handle all but the really big problems. Then install a *private* phone to headquarters — *and give the number only to a few key people.* And don't broadcast the physical location of the headquarters, either.

**4. PLAN FOR A GOOD RECEPTION CENTER** • First impressions are tremendously important. At Chase they did several things worth noting:

- They did *not* use their usual reception facilities for regular plant visitors. With thousands of people expected, it didn't make sense. Chase cleared a large area at one end of the plant. The area was freshly painted and equipped with a display of company products. Nothing fancy. It didn't have to be.
- They located the reception center so it was at a "natural" starting point, adjacent to the stopping place of the busses that provided free transportation from the center of Waterbury. That permitted the whole tour to be taken without backtracking or needless walking (important where, as at Chase, the tour was 1.2 miles).
- They staffed the center with men from the research department — who helped visitors by answering questions about products on display.
- They provided visitors right off the bat with a beautifully edited souvenir booklet, *My Trip*

*Through the Chase Metal Works.* Most open house programs feature such a booklet. This one is by no means the fanciest FACTORY's editors have seen. But it is one of the clearest, most interesting, and easiest to read. Most important, it avoids the temptation to "sell" the company.

• They arranged a public address system in the reception center, over which a brief welcoming address was delivered periodically. This helped to create the "glad-you-are here" atmosphere. It also oriented visitors, and helped start them on the tour.

**5. PLAN TO SAY GOOD-BYE GRACEFULLY** • The last impression is just as important as the first. But it's often overlooked. Chase set up a public address system at the end of the tour, thanked the visitors for their interest, and expressed the hope they had had a profitable time.

Reports say reactions to this little gesture were excellent. Another favorable factor was the fact that the company set up its refreshment tent right near the point where the farewell comments were made. Thus the visitors went directly out to sample some more of the company's hospitality.

**6. KEEP YOUR TOUR SYSTEM FLEXIBLE** • In many ways, it may seem more convenient to "batch" open house visitors, sending them on the plant tour in groups of standard size. Sounds good, but involves herding visitors and ordering them around.

Chase's plan was simple. They decentralized their guides, posting them at fixed stations, each a key point along the tour path. They kept people from wandering off course, and at the same time they could explain the operations on view or answer questions. Thus they supplemented the numerous signs, posted at strategic points, that identified machines, described their functions, and listed replacement costs.

Yellow lines painted on the floor helped guide the visitors. There was no loss of interest by not herding visitors through. In fact, they had a better chance to pace themselves as they wished.

**7. RUN THE PLANT DURING THE TOUR** • This is often one of the big questions in open house planning. It's a temptation to shut down, or maybe just "stage" a few key operations.

*Chase's advice:* Don't take the easy way out. Run your plant tour on regular working days, so visitors can see things just as they are. To do anything else will probably give them a wrong impression.

Does "run-the-plant-as-usual" interfere with production? Not a bit, says Chase. If anything, you can count on better production.

**8. BREAK OUT THE RED CARPET FOR EMPLOYEES' FAMILIES** • Employees and their families are keenly interested in open house celebrations. So it's important to do all you can to make sure you have taken care of your own "family" properly. The same thing applies to nearby business offices of the company and to stockholders.

After surveying other company practices, Chase decided the best and simplest idea was to set aside one full day for employees and their families and for other company-connected groups, including stockholders. This was the *first* day.

But there were no restrictions on employees who wanted to make the plant tour on the other days of the open house program. Thus there were no arbitrary rules to irk employees.

**9. SCHEDULE VISITING HOURS REALISTICALLY** • Running an open house is hard on all hands—guides, guards, food service workers, and executives. You want these people to be as fresh and alert as possible when crowds of visitors are flowing in. Yet, by not figuring out your schedules carefully, you can end up with a half-exhausted staff before your real crowds begin to show up.

Initially Chase set its schedule to run from 8:30 a.m. to 8:30 p.m. But morning hours turned out to be pretty much wasted. Comparatively few visitors showed up. Here's the breakdown: 8:30–12:30, 13.4% of all visitors; 12:30–4:30, 21.8%; 4:30–8:30, 64.8%.

So, when Chase recently ran another open house for its two Cleveland brass mills, the program didn't start till noon of each visiting day.

**10. PLAN THOROUGHLY** • You'll get ideas for your plans from these highlights of what Chase did:

• All master planning was done by a general plant tour committee. The committee held 24 meetings between July 24 and October 26, a few days before the program was run off.

• The minutes of committee meetings alone run to better than 40 pages. And these minutes are merely summaries, in brief form.

• Five subcommittees carried out detailed plans, supplementing the master committee. These subcommittees added many more meetings to the total. Here final details were settled for each major function: the tour route, safety, transportation, publicity, and refreshments.

• Individual subcommittee chairmen were made completely responsible for every element of the final plan for each function. The safety committee chairman, for example, constructed a 15-ft. paper map of the route of the tour, and planned the location of guards, safety patrolmen, and warning signs just as if he were an army officer laying out battle plans. Sounds like needless work? Perhaps. But the result was that not a single one of over 13,000 visitors sustained even a slight injury.

**TO SUM UP** • In Chase's opinion, open house planning is not something you'll be doing often—which means you won't be able to acquire skill through practice. Next best thing is to sample the best experience of others, and work and work to make the program succeed. There's no point in running open house unless you do it superbly well.

THE PEARL HARBOR STORY

# Management

*• This story began in 1948 in Pearl Harbor, at the Naval Shipyard. This is one of the larger of 11 shipyards serving the U. S. Navy. There are now about 950 men in the plant engineering function. Six are Navy officers, the rest, civilian employees.*

*The maintenance problem there is the same as in any manufacturing plant. The Public Works Officer and the Public Works Department are equivalent in status to the plant engineer and the plant engineering department in industry.*

*In the fall of 1948 economy became the Navy watchward. At Pearl Harbor and elsewhere the Navy was out to cut maintenance costs. In case you don't realize it, the Public Works Department can't write its own ticket in expenditures. Every penny of its budget must be spent wisely and efficiently.*

*This was the problem faced by Commander R. S. Stewart, when he became Public Works Officer —or plant engineer, if you please—in the spring of 1950. It wasn't an easy one, even after the substantial progress his predecessor had made in the previous year and a half. Over the next two years Stewart studied the operating conditions, developed his ideas, and built up a program to cut plant maintenance costs.*

*About a year ago FACTORY editors were privileged to review this entire program. We have discussed many of its features with Commander Stewart. It's one of the best jobs in organization of maintenance we've ever seen.*

*We believe Stewart's problem is industry's maintenance problem today. As we see it, the inefficiencies he corrected were not caused primarily by lack of technical know-how. Nor by lack of system. Pearl Harbor had a good work-order system, material controls, and accounting procedures. But it wasn't making best use of them. It needed new administrative policies and procedures, as does much of industry.*

*The new management techniques that Pearl Harbor has adopted fill a loose-leaf binder 2 inches thick. It's impossible to digest this mass of material for you. Instead, we have extracted highlights that will show both top management and the plant engineer how to attack the plant maintenance problem—how to slam the brakes on mounting costs.*

LET'S BEGIN THIS REPORT by looking at the results of Commander Stewart's program.

For the moment we'll focus the searchlight of inquiry on two spots. They are Stewart's direct answers to two questions invariably raised by top management when somebody suggests improved administrative activities in the plant engineering or maintenance department.

**QUESTION • Does management attention to plant maintenance pay?**

**STEWART** • In January 1949, the ratio of plant engineering employees to total shipyard employees was 1 to 2.9. Today this ratio is 1 to 6.21. Expressed in another way, the plant engineering department is supporting a 35% increase in production personnel with 37% fewer plant engineering employees. The latter reduction amounts to a saving of about $1,600,000 per year in salaries alone.

That's the cold dollars-and-cents appraisal of the achievement. To be fair, you need to add to this such important facts as better departmental morale, better planning and scheduling of work, less equipment downtime, and close control of costs.

**QUESTION • But what does all this added effort and paperwork cost in extra overhead?**

**STEWART** • Rigid controls, of necessity, require a higher overhead rate than loose or no controls. On the other hand, if a small increase in the overhead results in a substantial decrease in productive cost, it certainly is justified.

Take our case. Our current overhead rate—based

Meet Commander R. S. Stewart, CEC, USN. Until a few months ago he was Public Works Officer, Civil Engineering Corps, U. S. Naval Shipyard, Pearl Harbor. Now Uncle Sam is using his administrative talent in Washington, D. C.

When Stewart first met the editors of FACTORY he said: "I've been reading in FACTORY all about how industrial plants have used modern techniques to cut maintenance costs. Your publication has been a veritable gold mine of ideas on that subject. But I want you to know that the U. S. Navy can do a good job, too, in saving taxpayer's money." We agreed when we saw the maintenance program he instituted at Pearl Harbor.

So we asked for and got permission to report this achievement in FACTORY. For understandable reasons we have to add this formal Navy tag: "The opinions and assertions contained herein are not to be construed as official or reflecting the views of the Navy Department or the naval service at large." Which formality, you'll agree after reading this article, doesn't detract from its value one whit.

# Techniques Cut Maintenance Costs 20%

on relation of non-productive to total maintenance employment—is 16.5%. In January 1949, it was 13.3%. An increase, yes. But the present overhead *cost* is less. The accompanying tabulation of the number of indirect employees makes my point. ——▶

| EMPLOYEE CLASSIFICATION | OFFICE OVERHEAD | | | | | | SHOP OVERHEAD | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|
| | ADMINIST. | | ENGINEERING | | OTHER | | | | | |
| | 1949 | 1952 | 1949 | 1952 | 1949 | 1952 | 1949 | 1952 | 1949 | 1952 |
| CLERICAL-PROFESSIONAL | 32 | 20 | 14 | 11 | 5 | 8 | 19 | 13 | 70 | 59 |
| SUPERVISORY | | | | | | | 106 | 64 | 106 | 64 |
| NON-PRODUCTIVE | | | 1 | 1 | 5 | 11 | 5 | 12 | 11 | 24 |
| MILITARY (EXECUTIVES) | 5 | 6 | | | | | | | 5 | 6 |
| TOTAL | 37 | 26 | 15 | 19 | 10 | 19 | 130 | 89 | 192 | 153 |

As you see, we reduced our shop supervisory personnel—a result of the sizable decrease (420) in direct-service personnel. Also, we were able to reduce the clerical staff. This was due primarily to eliminating duplication of work and processing of non-essential records. The marked increase in the "non-productive" category is the result of employing more planners, estimators, and shop planners.

Make up your mind that, if you want administrative controls, you need overhead personnel. It's a choice between economy *with* controls and loose spending *without*.

## How Pearl Harbor diagnosed its maintenance troubles

**1. BEGAN WITH A SURVEY.** Late in 1948 the Navy Department began to collect statistics on maintenance work performance in all its shore establishments. These statistics covered all the functions of plant engineering in maintenance and operation of the entire plant.

**2. SET UP YARDSTICKS.** As a result of the accumulation of these data, the need arose for yardsticks to measure performance of each function at different shipyard locations. First step was to define what was to be measured. All plant engineering activities were eventually reduced to ten major functions, such as administrative and shop expense, maintenance of grounds and structures, maintenance and operation of utility plants and systems, and so on.

Each of the ten functions was further divided into sub-functions. For example, the major function of utility plants and systems was broken down into steam generation, steam distribution, electricity generation, electricity distribution, pneumatic power, water, and sewage treatment plants. All in all there were 36 sub-functions to be measured.

Next step was to define the unit of measurement. This unit differed for each sub-function. The unit for administrative and shop expense, for example, was the average number of personnel. For steam, electric, or water distribution it was thousands of feet of distribution system. For materials handling equipment it was the number of self-propelled pieces maintained. For refuse collection and disposal, it was cubic yards of refuse.

**3. COMPUTED WORK PERFORMANCE.** The performance rate of any function over any period of time could now be computed by dividing the actual number of man-hours applied by the number of work units completed in that time. To illustrate, a total of 91,346 man-hours for one month, divided by a personnel of 955 gives a performance rate of 95.65. A total of 24,877 man-hours divided by 6913 steaming boiler hours gives a rate of 3.60. These rates, of course, are abstract, and useful only for historical comparisons.

**4. DEVELOPED A UTILIZATION INDEX.** Based on the work performance rates from all its shore establishments, the Navy Department set norms, or work performance goals, to shoot at. While no allowance was made for variations in types of con-

struction or effects of geographical location, the norms did help considerably to highlight areas of excessive cost or sub-standard performance. Perhaps their best value was in local analysis.

Basis of local analysis as well as interstation comparison was called a utilization index. This index was computed by dividing the norm, or allowance, for each function by the actual performance rate, times 100. The average of all functions gave an over-all station index.

**5. INTERPRETED THIS INDEX.** A little thought shows you that a utilization index above 100 indicates a case of above-average productivity of labor, or insufficient maintenance, or a combination of both. Conversely, an index below 100 indicates below-average productivity, or over-maintenance, or both.

Pearl Harbor's over-all index in the period from November 1948 to May 1949 varied between 80 and 90. It is now known that low productivity and over-maintenance were the cause. A forced economy reduction in manpower between May and November, 1949, advanced the index to 113. This was obviously a result of work units remaining constant while the labor decreased. However, the tendency to over-maintain continued. Some facilities that got too much attention remained in excellent condition while other facilities were neglected. Witness the gradual drop in the index from 113 in November 1949 to 94 in April 1950.

**6. SEARCHED FOR CAUSES OF UNSATISFACTORY PERFORMANCE.** The continued evidences of unsatisfactory work performance led Commander Stewart's predecessor in November 1949 to undertake intensive studies covering maintenance policies, organization, and procedures. This program is the result. It has pulled the Pearl Harbor utilization index from 94 to 119 without increasing the working force or sacrificing maintenance standards.

# How Pearl Harbor improved its maintenance set-up

One thing is clear, Commander Stewart reports, after 3 years of research and experimentation in the field of management of maintenance. You need to take a long-range view. No good system can be installed overnight. The process is and should be a slow one.

Here are several reasons. You have to adapt recognized principles to the peculiarities of your own plant. You need time to develop reliable statistics. Procedures that at first look desirable may prove wholly or partially impractical of administration.

Strongest reason of all, perhaps, is this. The job of building an efficient maintenance department involves many factors. They are all interdependent. You can't run a good methods improvement program without proper organization. But neither will good organization of itself guarantee efficient work performance.

At Pearl Harbor the problem resolved itself into a natural sequence of four major steps. In pursuing them, Stewart established many basic policies and procedures which apply in any industry. In fact, he got most of his ideas from industry. What follows is a skimming off of those policies and procedures that best show the importance of good administration in maintenance.

## Step 1. Establish the organization

Right at the start Commander Stewart faced the question that always pops up in devising or improving any maintenance organization. Should first emphasis be placed on procedures, and let organization follow? Or should you establish the organization first, and then design procedures to fit? He chose the latter method. Except for a few minor changes, the revised organization stood up. In retrospect he knows it's best to check your organization before all else.

**Responsibilities need definition.** The plant engineering department at Pearl Harbor is responsible for the maintenance of all plant facilities and equipment, and the operation of utility generating plants and transportation equipment. Machine tools are maintained by the department using them. There are advantages, Stewart feels, for *one* organization to handle *all* maintenance, including production equipment. But this is not Navy policy as yet.

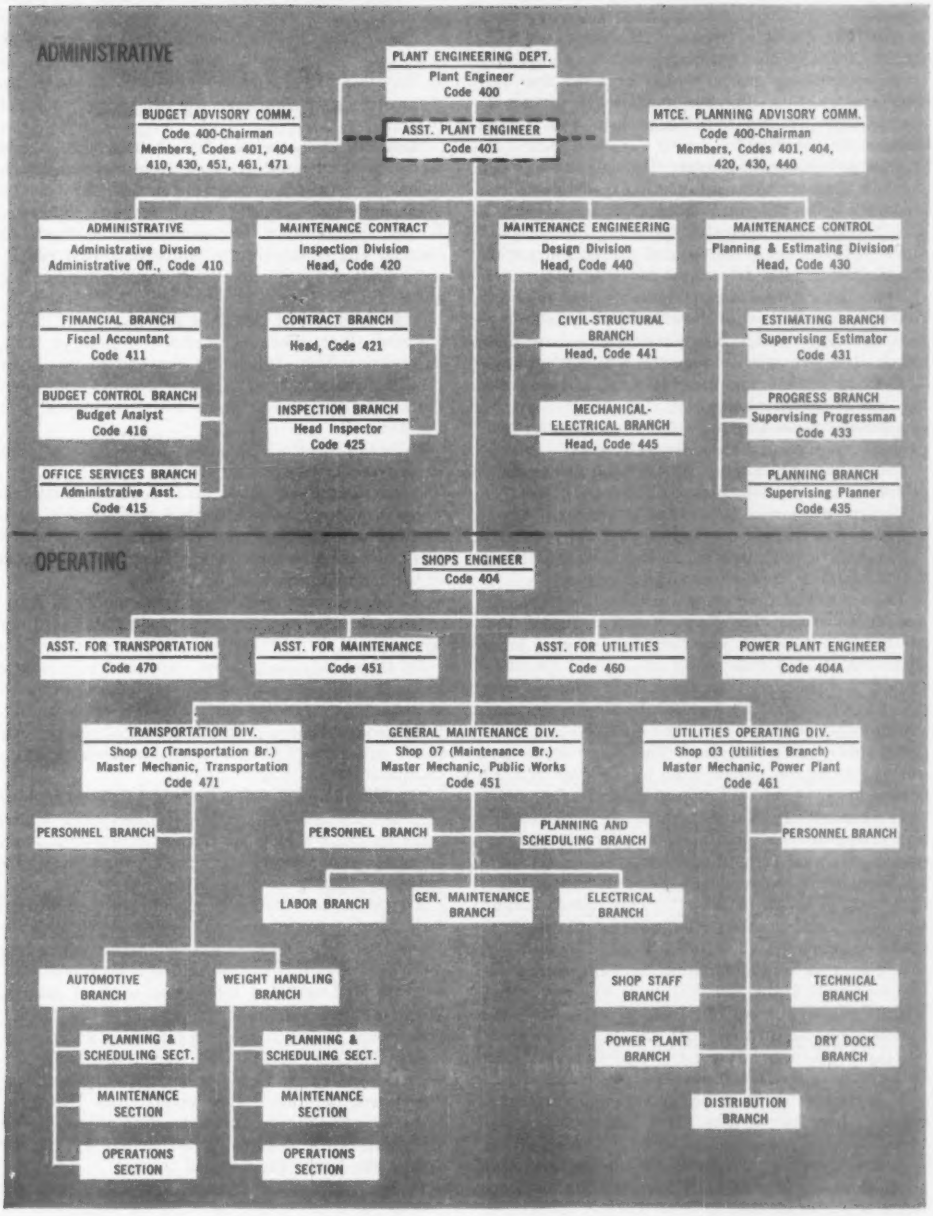
**Approach to problem.** There were two related steps. First Stewart studied the methods and policies of successful organizations having the same maintenance scope. Second, after acceptance of good methods and policies, he designed an organization that could administer them.

An analysis of successful maintenance organizations showed that they had at least three important administrative policies in common:

1. A strong, clearly drawn planning and scheduling policy that places these activities at both the administrative and operating level.

2. Equally important, an all-inclusive preventive maintenance policy that calls for realistic, scheduled inspections of all facilities and equipment.

3. A budget policy that provides for participation by top *operating* supervision as well as *management* in the maintenance department in preparing budget estimates and controlling expenditures.




**Organization chart.** Best way to see how these administrative policies influenced the Pearl Harbor organization structure is to look at the chart above. This is a simplified, condensed chart of how Pearl Harbor's maintenance set-up will look when completed—it's almost there now. Actual naval titles and labels have been translated, where necessary, into industrial nomenclature. *Turn the page*

One point to remember: Make titles and department names sound as descriptive of their functions as possible, cautions Stewart. It eliminates confusion, helps in understanding of the duties and responsibilities of each person or unit. For example, what Pearl Harbor has always known as the "Design Division" is better described as "Maintenance Engineering."

**Two independent groups.** The plant engineer has two different groups reporting directly to him. Headed by the "Shops Engineer" is the operating group, which is responsible for doing the assigned work. It totals about 880 men at present, including three master mechanics and 50-odd supervisors.

The other group is an administrative one. It consists of various staff departments and committees, which are designed to provide an independent check as to the quality, quantity, and cost of work performed by the operating group. Its personnel breakdown by functions is:

Administrative Division—12 (stenographic pool of 3, accountant and assistants, clerks)

Inspection Division—4 (1 clerk, 1 professional engineer, and 2 subordinates)

Design Division—13 (professional and sub-professional engineers)

Planning and Estimating Division—11 (1 head, 5 field planners, 5 planners and estimators)

The inspection division was established to handle outside contracts. The Navy found it a good tool for leveling the work load, and used it on a large scale. It needed this group to prepare specifications and inspect contract work. In smaller volume this function could be handled by a planning and estimating division.

**Organization principles.** There are some important principles nailed down in the Pearl Harbor organization chart that you shouldn't miss:

1. Responsibility for determination of the extent and frequency of repairs rests with the maintenance planners (administrative) rather than the maintenance crew supervisors (operating).

*Reason given by Stewart:* "This determination should always be the responsibility of management, not the supervisor."

2. Planning and estimating and inspection divisions report to the assistant plant engineer rather than the shops engineer (sometimes called the maintenance superintendent).

*Reason given by Stewart:* "This function must be as close to topside as possible."

3. Separate staff group conducts preventive maintenance inspections, and channels recommendations to planning and scheduling staff group.

*Reason given by Stewart:* "Work planning and scheduling can only be successful if *all* maintenance work is processed through *one* division. Control of maintenance work logically centers in the planning and scheduling function. Work generated as a result of inspections should follow the same route. A separate, full-time inspection staff releases operating men for their prime duties. It also removes the temptation of piling up unjustified or 'made' work."

## Step 2. Determine the work load and performance

How big is the whole maintenance job? How many men are needed? Are there too many men in one section, not enough in another?

These questions typify Pearl Harbor's problems. To get the answers, Stewart set up methods to identify the nature of the work and who did it, then analyze results to make improvements. The methods:

**1. Divided labor into two groups:**

**Fixed**—that which is normally repetitive on a daily basis. Time is usually charged to the same standing job order or expense account—janitors, truck drivers, power plant watch standers, and the like.

**Assigned**—that which is available for assignment to non-recurring jobs by specific order.

**2. Divided fixed labor into general functions.** These functions were identified by alphabet code prefixes to each job order number. No work was done without an order number. They included tasks of the following nature:

*A) Transportation.* Routine maintenance of automotive, weight handling, and materials handling equipment.

*E) Overhead.* Shop labor expended in cleaning shop, preventive maintenance to shop equipment, shop planners, clerks, shop storekeepers, training.

*H) Housekeeping.* Office janitorial, gardeners, trash collectors (special cleaning covered by a specific order).

*M) Miscellaneous maintenance.* Labor on routine trouble calls and some predetermined work which is by nature not readily subject to pre-estimating or scheduling. Job takes 2 man-days or less. Bigger jobs are handled by assigned labor.

*X) Operation.* Labor to operate cranes, trucks, fork lifts, power plant.

*Oa) Repetitive work under standing job orders for Naval activities other than the shipyard.*

**3. Divided assigned labor into general classes.** Work in these classifications was done by specific job orders. It was subject to planning, estimating, and scheduling before execution. Obviously this type of work received better control at both supervisory and administrative levels than that performed by fixed labor under standing orders. Hence the more work that could be routed by specific orders, the better the over-all control.

*I) Improvements.* Changes in plant property where use was changed or value increased.

*R) Remodeling.* Rearrangement of plant property where use or value was unchanged.

*W) Specific maintenance.* Maintenance jobs which are covered by a specific order, and are scheduled through the shop.

*Os) Other work.* Jobs for Naval activities other than the shipyard.

In setting up the classifications in items 2 and 3, Pearl Harbor had the alternate choice of a functional breakdown along the lines of Step 1, involving many more divisions. The simpler one was chosen because it didn't need mechanical tabulation, required less clerical work, and met the need.

**4. Determined labor required for fixed functions.** Manpower for most of the fixed maintenance functions could be and was determined exactly. The rest was easily estimated. At Pearl Harbor each function was listed to determine the total number

| HOUSEKEEPING | NUMBER OF MEN GARAGE | ROUNDHOUSE | GENERAL MTCE. | TOTAL |
|---|---|---|---|---|
| Trash collection | 11 | 2 | 11 | 24 |
| Streets & road cleaning | | | 8 | 8 |
| Grounds care | | | 25 | 25 |
| Janitorial | | | 19 | 19 |
| Total manpower | 11 | 2 | 63 | 76 |

of employees required on each job each day. The tabulation shows the synthesis of the H (housekeeping) function.

The same method of analysis was applied to all functions until a total fixed force was established. Of course, past practice was the original basis for this computation. But as later parts of the program took effect—checking work performance and conducting methods analysis—gradual reductions followed. This analysis was made by the plant engineer. You can't expect foremen to do it. They can't be objective, and would tend to justify size of their existing crew.

**5. Estimated labor needs for assigned work.** This work included minor construction, remodeling, and repairs called for by the preventive maintenance system. Here, again, past experience served as the best source of data. Also, size of force depended largely on the maintenance policy on standards. Pearl Harbor was able to reduce its assigned forces considerably because these standards were checked by trained inspectors reporting directly to the assistant chief plant engineer.

Up to this point you have seen how Pearl Harbor arrived at the "theoretical" size of its maintenance force. This was the basis for establishing local yardsticks, or allowances, against which actual manpower performance could be checked. It suggested manpower re-alignments. More will be said on this later in discussing budgetary control.

**6. Established a routine for reporting labor distribution.** Each week all maintenance supervisors in the three operating groups reported the breakdown of the work done by their labor crews according to the six functions or four classes of work set up in items 2 and 3. For this they used a daily report, as shown below.

| NAME | BADGE NO. | JOB ORDER & PROJECT NO. | DATE / DESCRIPTION | | TOTAL TIME M/HR | LABOR DISTRIBUTION IN HOURS — MAINTENANCE FUNDS: LV | A | E | H | I | M | R | W | X | TOTAL | OTHER FUNDS: Oa | Os | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A. MEDEIROS | 3090 | 4846 / 054443962?2 | BLDG. 143 RELOCATE BAR | ST | 8 | | | | | | | | | | | | 8 | |
| | | | | OT | | X | | | | | | | | | | | | |
| J. SILVA | 3092 | M496-2 / 05842391928 | BLDG. 143 - C.O.M. REPAIR FAUCETS | ST | 8 | | | | | | | | | | | | 8 | |
| | | | | OT | | X | | | | | | | | | | | | |
| K. SUMIDA | 5098 | M496 / 05842391928 | KAILUA OFF. CLUB REPAIRS | ST | 8 | | | | | | | | | | | | 8 | |
| | | | | OT | | X | | | | | | | | | | | | |
| J.C.C. KIM | 5002 | 4667 / W44296503 | BLDG. 209 - RENEW REFRIG. DOOR | ST | 8 | | | | | | | | 8 | | | | | |
| | | | | OT | | X | | | | | | | | | | | | |
| L. KAHOONEI | 4993 | 4733 / W44396255 | BLDG. 163 MISC. PLUMBING + REPAIRS | ST | 8 | | | | | | | | 8 | | | | | |
| | | | | OT | | X | | | | | | | | | | | | |
| M. CORREA | 3256 | 210 / M44414630? | TROUBLE CALLS | ST | 8 | | | | | | 8 | | | | | | | |
| | | | | OT | | X | | | | | | | | | | | | |
| B. TAVARES | 3978 | 4667 / W44296503 | BLDG. 209 - RENEW REFRIG. DOOR | ST | 8 | | | | | | | | 8 | | | | | |
| | | | | OT | | X | | | | | | | | | | | | |
| B. J. CHU | 3094 | | LEAVE | ST | 8 | 8 | | | | | | | | | | | | |
| | | | | OT | | X | | | | | | | | | | | | |
| TAKUMA | 3666 | 4778 | SHIP | ST | 8 | | | | | | | | | | | | | |
| | | | | OT | | | | | | | | | | | | | | |
| | | | TOTAL STRAIGHT TIME | | 13 | 1 | | | | | 2 | | 4 | | 7 | | 6 | 6 |
| | | | TOTAL OVERTIME | | | X | | | | | | | | | | | | |

These daily reports were reduced to a similar weekly summary (not shown) for each of the three main groups. In 3 months the plant engineer had developed reliable statistics on the distribution of all operating labor by crew, shop, and department.

*Turn the page*

**7. Analyzed labor distribution report** · First an analysis was made of each crew for work performed under M (miscellaneous) and W (specific jobs) classifications. This revealed that crews in the general maintenance division were doing jobs under standing orders that could have been done better by first estimating, planning, and scheduling them.

For example, the cleaning of storm drains was used as a fill-in job when pipefitters' work was slack. A crew of two pipefitters and two laborers would get the equipment together and commence cleaning. It would keep at this for a few days until more urgent work developed. Then it would stow the equipment away, only to get it out again and resume the job later, when work again was slack. As a result, labor was piling up an expense several times that justified by proper methods. The need was clear for labor control and methods analysis, which followed later.

A second 3-months' study, with emphasis on the reduction of work under standing orders in favor of specific orders, showed that the productive capacity of the maintenance forces had increased noticeably. Obviously the procedures of estimating, planning, and scheduling a higher proportion of the work were paying off.

**8. Developed a work backlog report** · A labor distribution report of itself doesn't determine the work load. You have to include the backlog. Therefore, beginning with the second 3-month period of analysis, Pearl Harbor established a procedure showing the backlog of uncompleted work on specific orders (classes I, R, W, and Os) on a weekly basis.

This backlog showed the man-days per week available for each crew, the man-days taken by standing orders, and the balance available per week. It also showed the total work load of specific jobs. Six weeks was decided upon as the ideal backlog. The backlog report therefore showed how many man-days excess (or deficiency) existed for each crew at the point of six weeks. This figure is referred to constantly in assigning the priority of the work and deciding how to do it—i.e., shipyard forces or outside contract. A second calculation showed the actual backlog in weeks. This helped determine start and finish dates in work scheduling.

**9. Used labor distribution and backlog reports to fix size of force** · These two reports on a continuing basis enabled management to keep track of the work load. A constant level of backlog accompanied by a uniform distribution of labor indicated an adequate crew to meet maintenance requirements. Minor fluctuations were adjusted by cutting down on or increasing extent of "leaves." Temporary up or down trends often were met by borrowing (or lending) men from similar trades in the production shops, by outside contract, or by loaning men to nearby activities. Permanent trends were met either by increasing the force, or by natural attrition or transfer.

## Step 3. Develop Control of Work Done

What now was needed was the perfection of a system of controls that would assure the best utilization of the work force. Basically, three types of controls were set up: (1) budgetary control, (2) preventive maintenance, and (3) job planning and scheduling. They were developed concurrently, but being independent of each other, could have been set up in any order.

**Extra benefits** · These controls offered these advantages:

1. Decreased office duties of supervisors, thereby allowing them more time in the field.
2. Reduced a lot of delays caused by poor planning.
3. Increased the productive capacity of the labor forces.

Here's a quick picture of what was done, and why.

**1. BUDGETARY CONTROL** · Pearl Harbor always had a money-value budget to guide the plant engineer in adjusting maintenance expenses to allotment. But Commander Stewart felt that this continuing job of adjustment was best done if it became every supervisor's job as well. Also he found it's impractical to expect the fiscal accountant to prepare an estimate—it requires intimate knowledge of the maintenance and operating requirements of the entire department. Hence these two improvements:

**1. Division heads and top supervisors have a voice in the preparation of budget estimates.** They are members of a new budget advisory committee, as shown in the organization chart on page 125.

**2. Budget goals are translated into man-days allowed per day.** It's easier to control work assignments in terms of man-days allowed than dollars available. A head janitor, for example, has difficulty in dividing a money allotment into labor and material and then dividing his labor into office cleaning, latrine cleaning, and leave. But if you restrict him to an average of 12, 6, and 2 men for these functions, you not only simplify his problem, but also get better cooperation in his assignment of personnel.

**Budget Procedures** · It's somewhat of an oversimplification to say here that labor is budgeted on the basis of the theoretical requirements described in items 4 and 5 of Step 2. Also, that performance is reported by the labor distribution report as described in items 6 and 7. But, in principle, that's exactly what happens.

The statistical results of these two procedures—basic labor force and actual labor used—are brought together on one form (not shown). This is called a labor budget report (in man-days) which provides:

1. Comparison between actual and budgeted labor expenditures, showing all variances.

2. A means of correcting budget to allow for unforeseen changes, by spotting variances that will re-occur if no action is taken.

3. Average expenditure to date, which can be converted into monetary values by a shop cost coefficient.

**Use of Yardsticks** · The comparison of actual and budget figures with its resultant constant check on variances alone has eliminated much inefficient use of labor. But another step was taken to check labor performance—the utilization index. You read about this yardstick early in the article.

At Pearl Harbor this idea is applied locally to a breakdown of 36 main functions and sub-functions. A special card record has been set up for each function. It shows for each month the total man-hours, total work units, performance rate, yardstick rate, and utilization index.

Total work units—square feet, cubic yards, operating hours—are corrected monthly for changes. The yardstick rate is predetermined arbitrarily on the basis of past performance. It's raised whenever improvement in methods or equipment justify it. But it serves as a benchmark for measuring decline or improvement in the *physical* performance shown by the current performance rate.

As in the man-day budget, yardstick variances must be explained. The shops engineer must investigate any performance rate exceeding the allowable rate by 5%. His report goes to the maintenance planning advisory committee, which recommends what corrective action is to be taken.

**Benefits** · We are told this technique of computing a utilization index has improved labor efficiency, in that it has pinpointed sources of waste otherwise unobserved in budget reports. It can do this right down to the job, the day, and the man. These data have also been helpful in preparing budgets.

**2. PREVENTIVE MAINTENANCE** · Maintenance and operating supervisors formerly determined the extent and frequency of repairs. To correct the tendency to overmaintain, Pearl Harbor transferred this responsibility to the new planning and estimating division.

Shop supervisors are limited in the amount of work they can authorize. They may handle trouble calls requiring less than 2 man-days and certain repetitive jobs of known manpower requirements. Breakdowns or trouble calls in excess of 2 man-days are referred to a maintenance planner. Thus all big jobs are controlled.

Duties of the planning and estimating division are these:

1. Making scheduled preventive maintenance inspections of all plant structures and equipment, and the machinery for which the plant engineer is responsible.

2. Determining the extent of repairs or adjustments needed to place or keep facilities in good operating condition.

3. Scheduling general overhauls of major equipment at realistic intervals, using manufacturers' recommendations as a guide.

4. Arranging equipment overhauls to develop a uniform workload.

**Personnel** · Maintenance planners were selected with care from the maintenance shops. They are craftsmen who can prepare accurate estimates of the work they generate. They must have sound judgment, be cost-conscious.

**Procedure** · Maintenance planners make their scheduled inspections 6 to 7 working hours each day, based on use of a tickler file. The rest of the day is used in preparing estimates and requests for job orders. These go to the head planner, who can approve jobs up to 5 man-days. The assistant plant engineer approves jobs from 5 to 25 man-days. All jobs over 25 man-days are referred to the plant engineer. These are jobs usually provided for in the annual maintenance budget.

Cost of each job is accumulated for each piece of equipment on a separate record. Costs are reviewed regularly for uneconomic situations.

**Benefits** · During the first 6 months, trouble calls were halved. Realistic schedules cut maintenance costs of power plant 30%. Crane maintenance costs dropped 15%. All these savings in no way impaired the service of facilities or equipment.

**3. JOB PLANNING AND SCHEDULING** · At Pearl Harbor no subject is more discussed or receives more attention, says Commander Stewart, than planning. It was the crux of the improvement program.

Job planning is done by the maintenance control division. The system starts with a work request. Most work requests originate from the maintenance planners when they are making preventive maintenance inspections. Planners must prepare requests in such a manner that, if approved, they can be copied directly on a specific job order.

All approved work requests involving 5 man-days or over are routed through the planning and estimating branch. The arrangement and presentation of the estimate is important. The information is arranged on the job order to show what each craft must do, and what labor and material will cost.

Each job order is accompanied by a job material list. Orders costing over $1000 or involving more than three crafts also get job schedules. Each schedule outlines the labor needed for each step or operation from start to finish. On large jobs the estimator first confers with the lead supervisor or shop planner. When ready, orders are sent to the shop. But no dates are set—this is the duty of the shop planning and scheduling group.

As previously mentioned, each crew in the general maintenance shop has a definite number of men on fixed jobs or operations. The remainder of the crew is held available for assignment to job orders.

The shop planner pockets each order until all material has been ordered or located and a definite

delivery date obtained. Then he distributes copies to each crew supervisor involved, and chooses a lead crew supervisor. Next he determines a starting date on the basis of available manpower.

He then prepares a labor progress card showing estimated man-days for each crew involved and posts it on a Sched-U-Graph master scheduling board. This progress card is the basis for making a master crew schedule which conforms with the master scheduling board. The sum of all master crew schedules equals the work on that board.

As each job progresses the actual man-days of labor are posted on the progress card. These man-days are obtained from the supervisor's labor distribution report described early in this article. While there is invariably some shifting of starting dates for emergencies, high-priority work, or unforeseen material shortages, there isn't much.

Shop planners do the actual work of preparing and keeping progress record cards and work schedules up to date. One man takes care of three or four crew supervisors, thereby relieving them of most of their previous office duties.

As a follow-up on completed job orders, Pearl Harbor issues a weekly report comparing actual and estimated man-days on each job order. It also issues a monthly report on actual and estimated material expenditures on all jobs closed out in that period. The head planner and master mechanic must investigate and report on every job out of line. Two good results: (1) better estimating—actual and estimated amounts come closer all the time; (2) better performance.

**Benefits** · A most encouraging aspect of the planning and scheduling program has been the enthusiasm of both the thinkers (planners) and doers (supervisors). The crew supervisor, by referring to his master schedule, has ample information to schedule material withdrawals and deliveries each day for the next day's work. Labor, equipment, and tool requirements can be planned for little or no loss of productivity any time of the day. Normally, each craftsman knows his next day's assignment.

## Step 4. Develop a methods analysis program

The program thus far described was directed to these four points:

1. Placing the craftsman on the right job for the whole day.
2. Equipping him with proper tools and materials.
3. Instructing him with the optimum amount of supervision.
4. Checking his performance against local yardsticks.

It has increased productive capacity markedly. But the fact that performance rates appeared to approach a minimum does not necessarily indicate top efficiency. The comparison of performance with an arbitrary experience standard merely shows trends. If the performance rate is low, it can mean either efficient use of labor or under-maintenance. If it is high, it can mean inefficient labor or over-maintenance.

Next step, therefore, was the study of work methods. Best place to begin was those areas or functions showing poor performance rates. No standard approach to methods analysis was possible because of the wide variety of operations. But certain steps were sufficiently common to all analyses:

1. List the individual operations making up the whole. For instance, in the case of janitorial service the individual operations included window washing, waxing, sweeping, dusting, emptying trash, and so on.
2. Prepare a review of scheduling methods, peculiar conditions, and method of doing each operation.
3. Compare the method used with those used by nearby plants, to spot improvements. Study publications devoted to the subject. Examine both editorial content and advertisements for leads to labor-saving machinery and equipment.
4. Assemble the data in an analysis summary in such a way that present cost of each operation can be compared with the cost of the improved method. The Terborgh formula served as an excellent guide in equipment replacement studies.

**Maintenance Planning Advisory Committee** · To provide a uniform method of reviewing methods analysis summaries, Pearl Harbor set up a committee to consider all reports. Its make-up is shown on the organization chart on page 125. Thus it utilized the best skills and judgment available. The heads (master mechanics) of each "operating" division were added as temporary members whenever desirable.

In actual practice, everybody from the worker up to top supervision is encouraged to submit ideas for methods improvement. Workers formalize their ideas through the regular suggestion system. Shop foremen originate methods studies, but more often the shops engineer requests them of the foremen. The value of time study in work measurement is not being overlooked, and may later serve as an important tool when further refinements are sought.

In many cases, the shops engineer can take action on the recommendations in an analysis report. It may be so evidently worthy or invalid that no further study is needed. This screening procedure allows the committee to concentrate on debatable or policy questions.

After hitting at the lowest performance targets, the methods-analysis program is aiming at successively higher levels. To get the most out of this approach, it must be a continuing program, without surcease. As it looks now, says Commander Stewart, a good methods improvement will develop by far the greatest savings of any of the steps toward efficient maintenance at lowest cost.

## CASES IN METHODS IMPROVEMENT

RYAN AERONAUTICAL COMPANY, San Diego, Calif.

# Blueprint for Better Methods

IF YOU THINK you can't lift usable ideas from the aviation industry, have a look at some of Ryan Aeronautical's new methods. Each points up a basic principle that can be applied across the board.

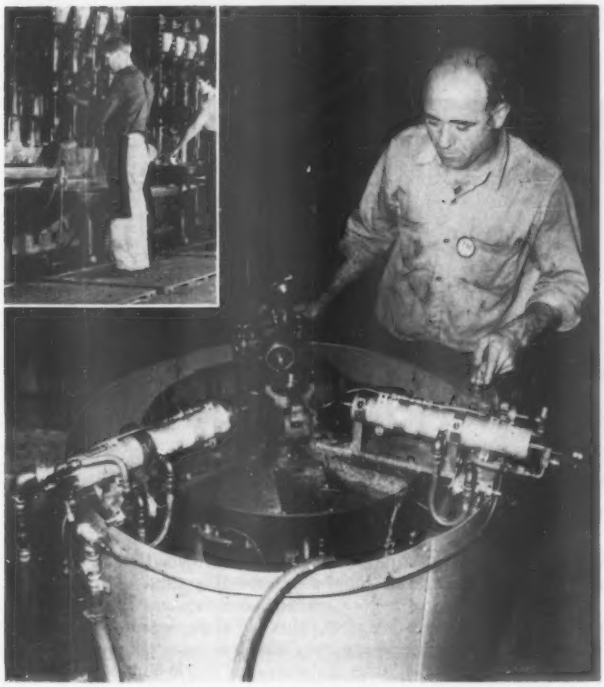
Ryan's blueprint for methods improvement, reports Methods Engineer Ernest Mellinger, is a strongly organized program. It works like this:

1. The methods engineering division has two sections. Manufacturing methods improvement helps manufacturing improve methods. Manufacturing control sets up cost controls for management and helps indirect departments with methods.

2. An area methods engineer is assigned to each production superintendent. His over-all job: to give methods service. Among his duties: Devise and request new equipment; modify existing equipment; help improve shop layouts; help coordinate production schedules with other departments.

3. At least one methods analyst works for each methods engineer. The analyst compiles information to justify new equipment, makes lengthy methods studies, helps investigate cost reports — he relieves the engineer of routine work. Freed from run-of-the-mill chores, the engineer gets out in the shop. That's where his presence stimulates cooperation — and sparks new methods.

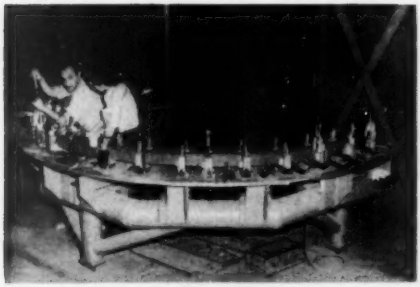
### 1. Make a multiple-tool, one-shot job out of single-tool jobs

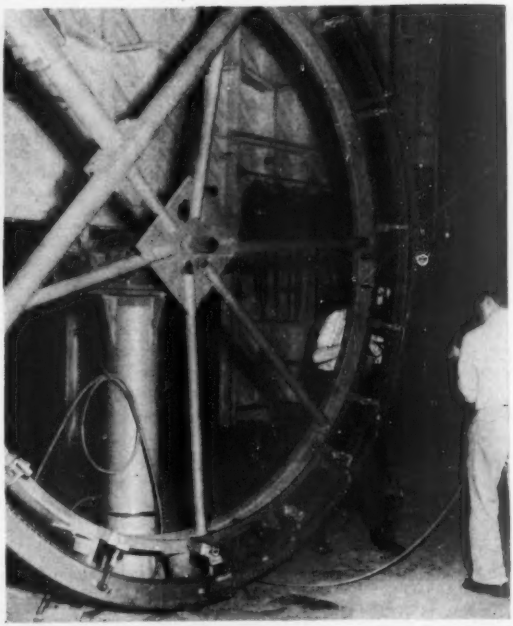


**OLD WAY** · Operators used traditional method (small inset) to drill three holes of different diameters in engine part. Jig held part while operator shifted it from machine to machine, drilling holes one at a time.

**NEW WAY** · Three holes drilled at one time by Ryan-designed, multiple-head, pneumatic machine. Operator places part in fixture, opens air valve. Automatic drilling heads drive, stop, and return drills. Drill heads are mounted on tub, which holds oil that's pumped to work and recirculated. Set-up can be changed for similar jobs. Savings: 35 minutes per part, $3000 per month.

**For more Ryan methods, turn the page.**

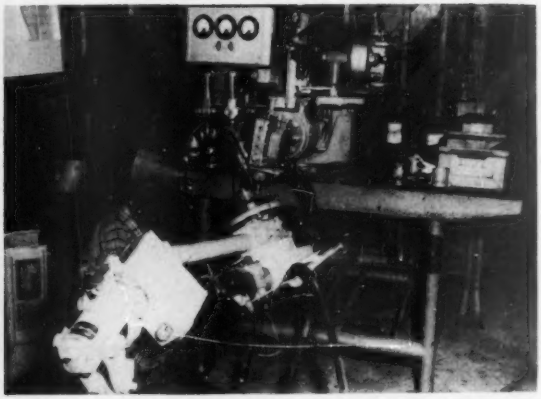




## 2. Try a "lying-down" job "standing up"

**OLD WAY** • Horizontal "belt frame" jig required 150 square feet of floor space. One good feature: Three legs (third is hidden) instead of four or more made it easier to plumb on uneven floors.

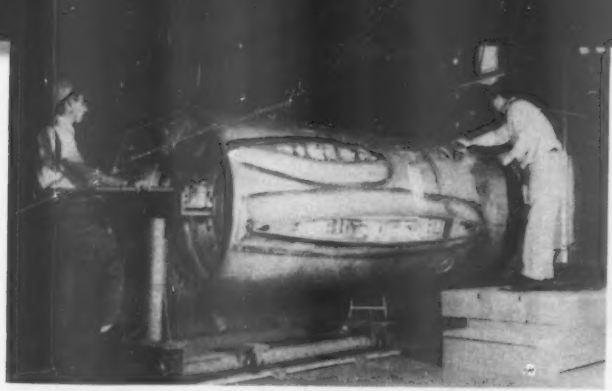
**NEW WAY** • Trunnion-type vertical jig for same belt frame requires only 55 square feet of floor — a 63% space saving. Jig revolves to place any part of assembly in convenient working position.



## 3. Look for new equipment that makes what you're using obsolete

**OLD WAY** • Stainless steel parts for exhaust systems were arc-welded manually. Even with foot-controlled device to turn parts, this method required 5 minutes per unit.

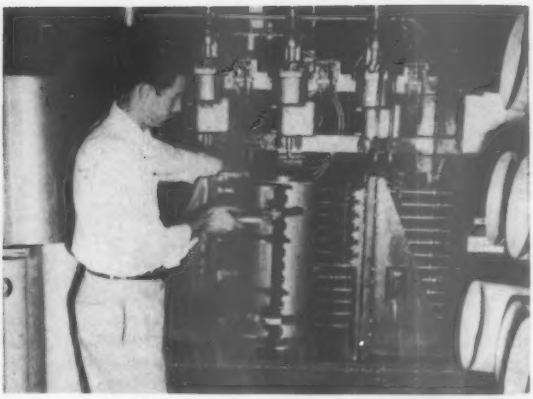
**NEW WAY** • Adaptation of Sigma (shielded inert gas metal arc) welding machine sliced welding time to less than 1 minute per unit. New method also requires less machining of excess weld metal. On this job alone, adapted Sigma has saved Ryan approximately $6000 a month. On other jobs, it has welded 1/16-in. stainless steel at 200 inches per minute.



## 4. Use positioners instead of helpers

**OLD WAY** • Two men needed to seam-weld tank. Operator (right) ran welder, signaled helper to move tank to right or left to keep seam-welding wheels traveling in true circle. Without constant check of alignment, weld might spiral.

**NEW WAY** • No helper needed. Operator controls alignment by air valve on stool at his right. Idea's so new valve wasn't permanently mounted when photographed. Air cylinder mounted on positioner (left foreground) moves tank. Steel dollies on tracks enable one man to move tanks into and out of welder. New method saves even more positioning on tapered tanks.



## 5. Try the multiple-head principle in welding, too

**OLD WAY** • Operator held and aligned outer combustion chambers while welding them in 12 spots — one spot at a time. Job required skill to keep parts round. Handling tired operator.

**NEW WAY** • Twelve welds are made simultaneously in fraction of former time by special machine with 12 hydraulically operated electrodes. It reduces operator fatigue by eliminating need for holding. Hydraulically expanded internal arbor keeps part round while welds are made, cuts out-of-round rejects by 70%.

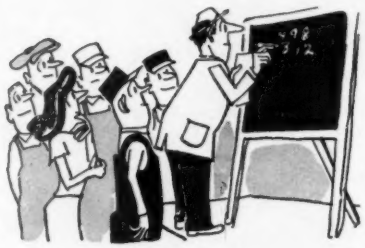
# TIPS TO GOOD HUMAN RELATIONS for factory executives

BY M. J. MURPHY • Industrial Relations Editor

**WHAT MAKES A "GOOD JOB"?** We're told this is a true story of what went on in a discussion with several shop operators. They were arguing this question: "Which would you rather have—a good job with a poor foreman or a poorer job with a good foreman?"

There was a brisk argument for a few moments—until one bright fellow popped up with this comment: "The question doesn't make sense. There's no such thing as a good job with a poor foreman!"

The argument stopped right there.



**SIMPLE ANTIDOTE FOR WORRY ABOUT JOB SECURITY** You don't always have to be elaborate or "fancy" to get good results. For example, in recent talk a man from a nationally known big company told this little story about a plan they'd developed for eliminating worry about job security:

In each plant the company just set up a blackboard on which they chalk production schedules (in man-hours) for as many as six months in advance. They change figures weekly, so workers get a pretty up-to-date idea of what's ahead. It's all strictly basic information—no interpretations or explanations. The company reports the space around the blackboard's always crowded. And production's been up since this simple plan was adopted. All this re-confirms the company's confidence in a simple motto: Give employees the facts, and they'll give you their cooperation.

**"CONTROLS FOR ABSENTEEISM"** That's the name of a really useful report just put out by National Industrial Conference Board, 247 Park Ave., New York 17. It's number 126 of the NICB's famous series of *Studies in Personnel Policy*. It's chock full of forms, procedures, and brief analyses of specific company plans for keeping the perennial absenteeism headache from becoming brain fever. Good job, worth studying.

**WHAT KIND OF EXECUTIVE ARE YOU?** Want a simple test of how broad-gage you are as an operating executive—one that you can use on others, too? Here it is—thanks to many FACTORY readers who have expressed the same thought in many different words:

Just ask yourself how "literal-minded" you are—how readily you can transfer ideas from one field to another. Can you pick up and adapt a good idea to your own problems even if the idea comes from a different industry or plant function or department?

If you *can*, you possess a key quality of practically every good executive. If you *can't*, you're probably the victim of what one man calls the "cookie factory complex." It's like this, he says:

"You make cookies, and you're not interested in anything but cookie making, so you're blind to all ideas that don't come from cookie makers."

*Suggestion:* Next time you talk to a subordinate who can't spark to any ideas that don't come right from his own backyard, assign him a job that will *force* him to look elsewhere. That should help—because practice improves a man's ability to steal ideas. And once your smarter boys catch on, they'll enjoy it—and make it pay off, too.

**AN IDEA THAT HAS "WIFE APPEAL"** Add this homely little note to the big story about Ford's fabulous Engine Plant on page 93 of this issue:

To encourage that all-important family interest in the breadwinner's job, Ford's Cleveland plant offers nominal prizes for favorite recipes and useful household hints. For every recipe that's printed in *Cleveland Ford News,* the employee magazine, the worker's wife who submitted it gets $2; for each household hint, $1.

What about husbands of working wives? No dice. Dishwashing husbands, for whatever reason, aren't eligible!

**SUGGESTION STATISTICS** Here are some statistics about suggestion plans that may help you evaluate your own plan. They come from a survey of 177 member companies, conducted by the National Association of Suggestion Systems:

For 1951, the "rate" of submission of suggestions was 308 suggestions per 1000 employees.

Of these, 27% were adopted. That's an adopted suggestion rate of roughly 83 per 1000 employees.

As for awards, the average amount paid to each person whose suggestion was accepted was $24.82.

These are all average figures, of course. But they give you something to think about if your own plan's figures are too far off.

**HERE'S A WAY TO IMPROVE YOUR REFERENCE CHECKS** Checking references — especially for key jobs —is no cinch. If you write, the answers you get are usually too good to be true. If you check in person—by phone or by visit—you get much better answers. But then your own bias for or against the candidate may color your judgment —does, in fact, insists one consultant who has found hundreds of key men for plants all over the country.

*Our consultant friend's solution:* Don't let one man do all the reference checking. "All we do," he says, "is split the checking between two men, one of whom has never even seen the applicant. After checking the references, the two men then pool their reports and impressions. If the fellow who knows the applicant is biased, he's caught up with in a hurry."

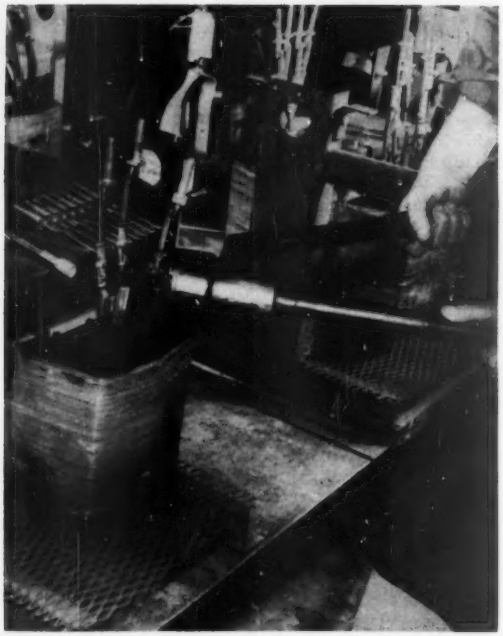
Probably not a new idea, but it sounds useful.

**YOU *CAN* MEASURE VALUES OF GOOD COMMUNICATION** Are you sold on the old idea that good communication with workers gives results that are too "intangible" to be measured? If so, the chart above—one of many—should jar your conviction. It's taken from a first-rate pocket-sized manual just released by General Electric. It shows the 5-year upward trend in production in one GE plant where there's a coordinated communication program. Some other results:

"One such plantwide program reduced all manufacturing losses by one-third over a 12-month period; another reduced one particularly critical form of loss 50% in three months. The accident record of another department was reduced to one-third of its former rate over a 3-year period. Within two years another plant reduced manufacturing losses from all causes by well over one-third. These results are typical—not unusual."

Want a copy? GE will be glad to send you one. Write on company letterhead to: Plant & Community Relations Services Division, General Electric Company, 570 Lexington Ave., New York.

**FROM THE OUTSIDE,** transformers with aluminum windings look just the same as those with copper windings.



**BUT INSIDE,** the coils are wound with flat aluminum wire of a special size. Above, crimping the two coil connections together.

CASE STUDY

# Aluminum Windings in Transformers

By J. W. ST. ANDRE • Electrical Editor, Factory

EDITOR'S NOTE: *Aluminum instead of copper for the windings in dry-type transformers—will it work?*

*Here is Electrical Editor St. Andre's report of the experience of one manufacturer—Westinghouse—and one customer—Alcoa. In 1948 Alcoa ordered 20 dry-type transformers with aluminum windings. Westinghouse made them. After 3½ years of service, one of these transformers was torn down and each part was inspected. Here is the story.*

*This is FACTORY's third article analyzing the problems and the advantages of using aluminum in the electrical field. You'll find "Aluminum vs. Copper in Your Electrical System" in September (page 132) and "Connectors for Aluminum Wire and Cable" in October (page 120).*

IN 1948 the Aluminum Company of America asked Westinghouse Electric Company for specifications and quotations on 20 dry-type transformers ranging in size from 3 kva. through 15 kva. These transformers were to be single phase, with 480/240 volts on the high-voltage winding, and 120/240 volts on the low-voltage winding. There was to be one major difference that would make these 20 transformers stand out from other run-of-the-mill transformer orders: *The windings were to be made of aluminum strap.*

Westinghouse was glad of the opportunity to try out aluminum for transformer windings. With the gradual reduction in the cost of aluminum and increase in the cost of copper, it seemed desirable to use aluminum, provided the problems and economics of construction could be worked out.

## PROBLEMS FACED

It was recognized that there were problems in the use of aluminum windings which would have to be solved. Considerable development work would be necessary before this new material could be applied universally.

**The immediate problem was to obtain flat aluminum wire** in sizes that would be suitable for winding the coils. These wire sizes were simply not on the market. The customer, Alcoa, also was interested in exploring this new use for aluminum and made up the special sizes of wire in the quantities needed to fill the transformer orders. The Buffalo plant of Westinghouse insulated the wire with glass fibers, using the same machines currently used for insulating copper.

**The next problem was the design of the transformers.** When aluminum is used for the windings, the proportion of aluminum to iron is different than for copper wire. This has to be taken into consideration if the most economical design using aluminum windings is to be developed.

In the case of the 20 transformers, however, Westinghouse was interested primarily in getting operating data and solving the problems of aluminum windings and connections, rather than in getting the most economical design. So for the new transformers Westinghouse used as many standard transformer parts as possible from existing models using copper windings.

**Winding the coils was not a problem.** It was necessary to develop a new winding technique because of the greater ductility of aluminum. But after the right tension was applied to the wire, workmen found they could wind the coils easily. They actually preferred the aluminum wire. It bent around the corners more readily, and thus made it easier to form rectangular coils.

**Making connections between the line leads from the aluminum winding to the copper terminals was a little more difficult.** Since the customer's wiring was copper, it was decided to keep the problem of making the connection from aluminum-to-copper connections internal in the transformer. In that way the customer would be connecting copper to copper on its distribution system.

For these 20 units, the connections from the windings to the cable leads which extend to the terminals were made with a soldered joint. The copper cable lead was wrapped around the aluminum strap used for the winding and soldered, using a special soldering flux.

While there were no joints in the windings, it was necessary to make a series connection between the different coils. The ends of the aluminum straps were overlapped and a tinned copper ferrule was wrapped around them. The whole connection was then given a "diamond" crimp, using a tool with special jaws.

**In early 1949 the transformers were completed.** Alcoa installed them in locations where the operating conditions would be as severe as possible. Westinghouse wanted to know about any defects that might develop from the aluminum windings. So did Alcoa.

**After 3½ years, Alcoa returned one of the units** that had been most heavily loaded to Westinghouse for examination. Westinghouse wanted to find out whether there had been any deterioration of the windings or connections. It also wanted to know whether or not there had been aging of the materials beyond what could be expected for this period of service.

Alcoa sent an inspector along to witness the checking of the transformer. The unit was completely dismantled and all parts were thoroughly examined and tested.

**No trouble of any kind was found.** The connections were opened up and proved to be in as good condition as when they were first made.

And no trouble has developed since then with any of the other transformers with aluminum windings built by Westinghouse on this first order.

## CONCLUSIONS REACHED

Experience on these first 20 units and on other units built since indicates that there is no problem from the service standpoint in the use of aluminum in transformer windings. The problems that are still somewhat troublesome are only problems in manufacturing technique and equipment.

- **Considerable design work** has been done, since these first units were made, to determine the best ratios of materials for transformers with aluminum windings.
- **The technique** of making aluminum-to-aluminum and aluminum-to-copper connections is being constantly improved.
- **For the crimping tool** a new type of jaw has been made that produces an oval section through the crimp. It applies pressure over a much larger area and so results in a better connection.
- **Also, inert gas welding equipment,** which was not in common use in the plants at the time the first transformers were made, is now available. Connections that would normally be brazed in copper windings are welded in aluminum. This gives a satisfactory connection, but it takes more time and is considerably more expensive to make than a brazed joint.
- **However, as more transformers are built** with aluminum windings the additional experience in using aluminum, better tools that will be developed, and improved methods of production will tend to cut manufacturing costs.

Therefore, there is no serious problem about using aluminum windings in dry-type transformers. The only criterion is its availability and the overall economics of its use.

| MAIN REASON FOR REJECTION | NO. APPLICANTS REJECTED | % OF TOTAL |
|---|---|---|
| TESTS: | | |
| Otis Test of Mental Ability (forms 1A, 1B, 2A, 2B) | 151 | 26.5% |
| Minnesota Personality Inventory | 55 | 9.6% |
| Clerical, Typing, Shorthand (Blackstone Stenographic Proficiency; Thurstone Examination in Typing, Form A; Thurstone Examination in Clerical Work, Form A) | 47 | 8.2% |
| Kuder Preference Record (interests) | 5 | 1.0% |
| Purdue Pegboard and Welding Test | 4 | 0.7% |
| Physical examination (including x-ray plate of chest) | 200 | 35.1% |
| Vision test (American Optical Sight Screener) | 4 | 0.7% |
| | 466 | 81.8% |
| SUBJECTIVE REASONS | | |
| Poor recommendations or reputation | 4 | 0.7% |
| Wrong attitude, or too ambitious | 4 | 0.7% |
| "Not qualified" | 10 | 1.8% |
| "Home conditions" | 4 | 0.7% |
| | 22 | 3.9% |
| REASONS "BEYOND CONTROL" | | |
| Miscellaneous (age, theft, refused to accept job, military service, draft status, related to employee, physical defects) | 27 | 4.7% |
| REASON NOT AVAILABLE | 55 | 9.6% |
| TOTAL | 570 | 100.0% |

# "REJECT ANALYSIS"

## a way to check your hiring skill

**Here's a simple technique to take the guesswork out of hiring. In this case it proved the value of a testing program. But it's useful even if you're not using tests.**

**It's worth trying—may startle you when you see the whole picture of why you've been turning applicants down.**

By MARY TYDLASKA • Psychometrician, and
WALTER MELTON • Assistant Personnel Manager
Columbia-Southern Chemical Corporation, Lake Charles, La.

HIRING INVOLVES the exercise of judgment. To the extent that this judgment is guesswork, costly mistakes in selecting workers can occur. To prevent such mistakes, various techniques have been used—all aimed at taking the guesswork out of hiring. For example: carefully designed application blanks, the standardized interview, reference investigations, and pre-employment tests. Use of such objective methods to supplement the interviewer's judgment is the desirable way to increase hiring accuracy.

One way to check up on how objective your hiring practices actually have been is to follow up the people you hire, and determine how successful they are at work. This is excellent, but costly and time-consuming.

Another way to get an idea of how objective you have been is to evaluate the applications of the people you *didn't* hire! This is easily done, and inexpensive.

To show how this technique can be used and the type of information revealed, the results of such an analysis at Columbia-Southern Chemical are presented in the chart at the left.

The personnel department has used a battery of tests (see chart) since the plant was opened in October 1947. So the main purpose of this particular analysis was to evaluate the role that the tests played in rejecting applicants.

We were interested in discovering how many rejections were due mainly to subjective factors (hunches, personal impressions), and how many were due mainly to low or abnormal test scores. The study covered 576 applications—all the "rejects" we have had since the plant opened.

**RESULTS** • The chart shows how our analysis worked out. About 82% of all rejections were based mainly on test scores. Only 5% were based on clearly subjective considerations.

This is a most satisfactory condition, in our judgment. It suggests that selection by guesswork has been supplanted by a judicious consideration of objective test data as the primary reason for rejection.

We should point out, however, that in our plant, tests are always used to *supplement* the application blank, interview, and reference check. They do not replace them. Used this way, tests make possible a more intelligent decision concerning rejection or hiring of applicants.

# Remington Rand Methods News

## Let's talk control methods at Cleveland Maintenance Show

***Many types of effective records for maintenance control can be studied at Booths 507 and 511, Public Auditorium, Jan. 19-22***

**For profitable new approaches to the record-keeping problems of a maintenance department, there's nothing like seeing how other firms get results. Also, at the Maintenance Show, we will introduce to you a new idea or two in maintenance control — demonstrated for the first time anywhere.**

**And, naturally, we will show you many of the production and materials control methods described in our manual X-1268. If you can't visit with us in Cleveland, be sure to send coupon below for helpful literature on subjects of interest to you.**

### Look to your preventive maintenance record for help in keeping plant output at peak

As production equipment grows more complicated, a breakdown becomes more costly. Preventive maintenance control is more vital than ever for plant efficiency. Your records must help *prevent* the failures – or else!

Maintenance superintendents who have a healthy hatred for paperwork always like our simplified visible methods which give maintenance *control* with minimum clerical work.

These methods visually signal the next inspection date for *every* piece of equipment; tell what inspection is needed; permit scheduling of work ahead. Every man's time can be planned for maximum efficiency. Maintenance work loads can be stabilized.

Also, these methods eliminate the guesswork on proper interval between inspections. Decisions can be made on the basis of actual experience for each type of equipment.

Likewise, the records help fix responsibility for an unnecessary breakdown; revealing whether the failure was due to operator abuse or careless maintenance work.

The plant engineer gets all the facts for determining when it will pay to replace a part or machine. He has a complete and convenient history of servicing and repair costs, as well as depreciation on the equipment.

These methods are flexible; can be adapted to your own special needs. See how they have been tied in with preventive maintenance manuals; adapted to special types of equipment such as electric motors; etc.

Study the procedures and methods, as well as preventive maintenance and property records used successfully in many well-known plants. Ask for folders **KD-656** and **KD-705**, also for methods file **MC-727** which is available on a ten-day loan.

### Get better maintenance from smaller inventory

There's a firm of 2,000 employees operating on a total maintenance inventory of only $30,000 *which turns over at the rate of nine times a year.* What's more, they don't have to worry about running short of any part or material needed to keep the machines running.

This achievement was made possible by centralizing the inventory records and the purchasing of maintenance supplies under a control system which Remington Rand designed and installed.

Previously, individual department heads had done much of their own buying. This led to wasteful duplication of stocks. Likewise, they passed up the valuable savings of volume buying because each plant bought from its own sources. Nor could they get the service which comes with planned buying.

Previously, an entire department might be shut down for lack of a single part in the stockroom when it was needed. Now the stocks cannot fall below a safe minimum on any item without management knowing about it.

Let us show you how such a system can work for small plants or large — with minimum paperwork. Ask for our new methods file **MC-802.**

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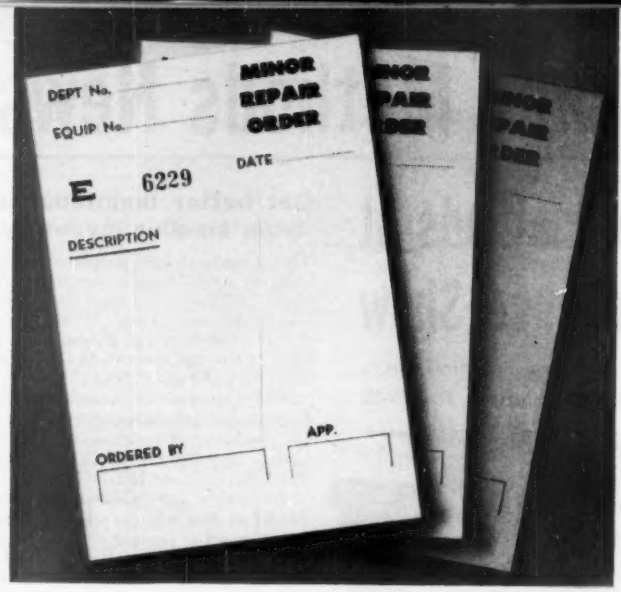


# One Simple Form Keeps Maintenance Orders Straight

NO WORK WITHOUT A WRITTEN ORDER NUMBER! This is a prime rule of every good maintenance work-order system. Absolutely no exceptions, if you want your costs to be right.

No smart maintenance executive disagrees with this rule. But many find fault with the ban against exceptions. Can't be done 100%, they say, unless you want to tie yourself up in red tape and inefficiency.

For example, what do you do in an emergency, they ask? Or what do you do when the production supervisor is miles away from the maintenance office? Or, when a maintenance foreman finds he can sandwich a small job in a sudden opening of a half hour? And so the excuses pile up on why it's impractical and unreasonable to forbid exceptions to the written-order rule.

Here's a simple paperwork technique that solves the problem. A FACTORY editor picked it up at the Monsanto Plastics Division in Springfield, Mass., where it has been in good use for some time.

Monsanto insists on written work orders for every job, major or minor. All types of orders follow the same pattern of flow. But since it's the paperwork on many minor jobs that creates the problem at hand, let's see how Monsanto handles it.

**RULE** · First you need to know how Monsanto normally routes orders for minor repairs. Every production supervisor carries a blank pad of consecutively numbered "minor repair" orders. The form is illustrated above, 3x5 inches in size. Each order consists of a set of *four* copies, with one-time carbon inserts—no fumbling for carbons.

When a supervisor issues an order, he gives the top three copies to the area engineer. The engineer routes them to the master mechanic's office where work scheduling and dispatching is done. (These three forms are bound at the bottom, incidentally, to prevent loss of any copy.)

The first (white) copy is kept in the dispatcher's box file. The second (yellow) copy is given to the maintenance foreman. The third (pink) copy is sent to the accounting department for tabulation of costs. Colors play a part throughout, as you will see.

**EXCEPTION** · Now what happens to this routine, say, in an emergency? For quick action the production supervisor telephones his request to the master mechanic's office. But he must still assign a work-order number from his pad and issue a confirming written order. In the meantime, the office copies his telephone request on a *special pad*, made up in the same form, except that the *order number* has been left blank.

This special pad has only two copies—a top original *green* and a carbon pink. The office sends the pink to the accounting department, to make sure accurate costs are kept right from the start. It keeps the green copy until the regular triple confirming copies arrive. Then the routing of the order form reverts to normal procedure.

**CHANGES** · Monsanto has gone one step further in keeping work orders straight. Let's assume the same production supervisor later requests a revision of his order. Maintenance writes this request on a pad made up of single green sheets also of the same format. These sheets are filed with the office copy of the original work order.

Each maintenance supervisor and craft foreman carries such a pad. It serves as formalized note paper. It does away with scribbling on miscellaneous pieces of paper lying around. Monsanto gains by having everybody use the same paperwork tool—simple, recognizable, and effective for any maintenance situation.

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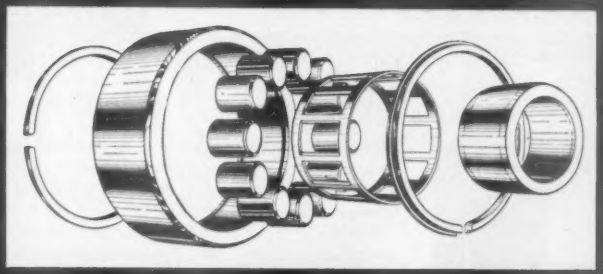

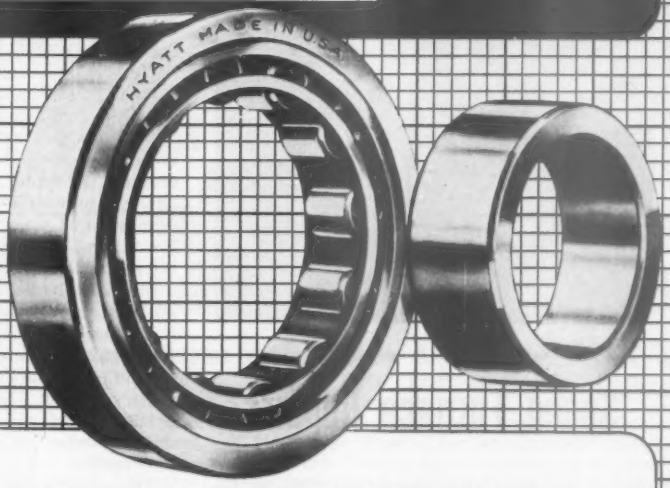


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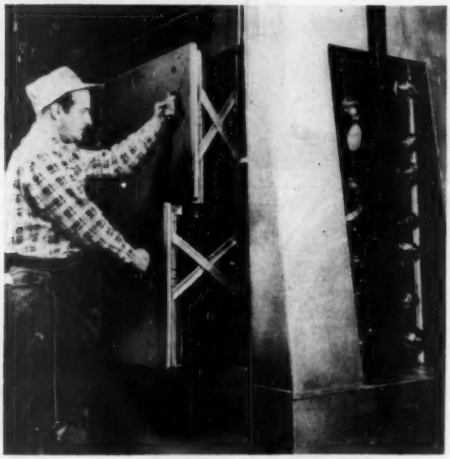
HYATT ROLLER BEARINGS

# JOE'S DEPARTMENT

## ELECTRICAL IDEAS EVERY PLANT MAN CAN USE

By JOE ST. ANDRE • Electrical Editor



With draw-out heating units like this one, you can . . .

## Speed Furnace Repairs

ONE OF THE MANY PROBLEMS in electrical maintenance is the repair of burned-out heating elements in electric ovens. The good old way is to shut down the oven and blow air through it to cool it down enough so an electrician can get inside and change the strip heaters or the grids. In large ovens the cooling-off period may run into days.

So how's this for good news? There's a new oven on the market that was designed with the maintenance man in mind.

I saw one the other day. It can be repaired with a minimum of downtime. The manufacturer took his cue from the draw-out type of circuit breaker that is so common today. The oven heating units draw out, as shown in the photograph.

Electrical connections to the whole section are made with prongs that are forced into receptacles when the heating section is in operation.

Whenever any maintenance is needed, you merely pull out the section to be serviced. Interlocks drop out the contactor supplying that section with power to prevent arcing on the prongs. The section swings out on hinges. Then you can remove the individual rod-type heaters and install new ones with the rest of the oven on heat. The repaired panel is then pushed back into place and energized. That's all. There isn't anymore.

Another feature of these draw-out panels is that they act as pressure relief vents if there's an explosion inside the oven. The whole top of the oven doesn't blow off. The panels are merely pushed out on their hinges, power is cut off automatically—and no damage whatever is done to the oven structure itself.

The individual rod heaters of this same oven are cleverly secured. All you have to do is loosen one screw to remove the heating unit. After replacement with a new unit, tightening the same screw locks in the heater and makes the electrical connections at the same time.

---

## Coming! A Way to Dim Your Fluorescents

For years the lighting industry has been looking for a way to control the light output of fluorescent lamps.

Now, by means of a new light-control system, developed by G-E engineers at Nela Park, Cleveland, the brightness of fluorescent lamps can be controlled merely with the turn of a knob. The lamps also maintain their original color during the dimming process, whereas the light of filament lamps gets redder when you dim them.

This system is still in the design stage and not yet in production. But I wonder if we may not be approaching the "era" mentioned in our April 1952 issue (Part 2, page B-100). At that time we suggested that plant lighting in the "factory of the future" would be adjustable to the worker's fatigue curve.

In other words, as workers tire during the day, the amount of light will be increased to give them a lift in morale and thus increase their productivity.

***For more items in Joe's Department, turn to page 146.***

DOW CORNING SILICONES

# make motors last longer

## Class H motor outlasts Class A 10 to 1 in spite of high ambients, heavy duty and accidental stalling.

Subjected to continuous 24 hour duty to meet increased production schedules, the 4½ hp dc Class A insulated transfer crane motors in a large midwestern foundry had a service life of only 2 to 3 months. Life for these overworked motors was further complicated by trips to the furnace at least once every 15 minutes where ambient temperatures run as high as 180° F.

After repeated failure, the rewind shop recommended Class H insulation. The first of these motors to be rewound with Silicone (Class H) insulation has now been subjected to such service for more than 2 years. During that period, the windings were exposed 4 times to temperatures far beyond the limits of any other class of insulation when the motor was accidentally stalled by broken armature bands. Four times it was simply rebanded, coated with silicone varnish, baked and quickly returned to service.

That kind of performance in thousands of installations proves that Class H insulation has 10 to 100 times the life expectancy of the next best class of insulating materials; withstands high ambient temperatures, reversing service, sustained overloads, and excessive moisture for long periods of time. It pays for itself over and over again in increased productivity and lower maintenance costs.

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# Clean Up Around Your Electrical Equipment

Sometimes we forget that good housekeeping is just as important around electrical equipment as everywhere else in your plant.

If your plant is typical of other plants around the country, a lot of your electrical equipment is located in corners and out-of-the-way places where you can't possibly put anything else. Panelboards are stuck under staircases. Transformers and substations are buried away behind packing boxes.

One plant I know of put on an economy campaign to shut off unnecessary lighting. The manager was always complaining that, when he rode past the plant at night, a certain area was invariably lit up. After a lot of hunting around, they finally found the lighting panel. It was hidden away in the stockroom. Took about an hour to move stock so they could get at it. No wonder these lights were always burning!

Now the point about all this electrical equipment in out-of-the-way places is this: It soon accumulates its share of rags, brooms, cams, old lumber—all those combustible materials that seem to be just waiting to start a fire if a spark flies from any of the equipment. Panel boxes seem to be just the place to hide old gloves and wiping rags. Even lunch buckets.

"Nobody ever goes near there," seems to be the attitude of the operators.

Oily rags are especially dangerous in power or control panels. Just one spark from a contactor and you may have a blaze on your hands. Spontaneous combustion will start rags smoldering. The oily smoke will carbonize insulators, provide a path —and wham! Up goes the panel.

So . . . clean up around your electrical equipment. Lock up your control and power panels. Make a rule—and enforce it—that only electricians have access to those panels. Other people in the plant have no business with such equipment and must stay away.

# Don't Wait for That Explosion

Like a lot of other people I know, you probably have hazardous areas in your plant. Some of them may have been added recently and you may not recognize them. So . . . check processes that involve vapors, dust, cleaning agents. The presence of static electricity may touch off an explosion.

Spray booths are one hazard that everyone should recognize. Yet I see booth after booth with lighting fixtures inside the spray area. Some plants don't even provide explosion-proof fixtures. Yet, even explosion-proof fixtures are banned in spray booths by the National Electric Code.

A good way to light these booths is to mount your lamps outside and have the light shine through glass windows in the top of the booth. Another way is to have spotlights shining into the spray booth from the outside. Reflector lamps mounted 10 feet or more away will floodlight the area nicely and still be far enough away from the fumes.

Special attention must be given to explosion-proof equipment. Every bolt and nut on the cover of a box or motor is needed in case of an explosion inside the device. Leaving one bolt or nut off may render that device useless. Underwriters Laboratories has tested these devices and specified the number required.

**Look out for seals.** Installing seals in devices and conduits as specified in the National Electric Code may not set well with your electricians. These seals make it very difficult to pull out wiring for checking and replacement. So, when wires are replaced, electricians conveniently forget to replace the sealing compound.

Seals are required so that if you have an explosion in a device—such as a pushbutton station or a motor starter, or inside the motor itself—the explosion can't get past the seal and expand into your conduit system.

Seals are doubly important if you have equipment in a non-hazardous area connected to equipment in a hazardous area. You can't take chances on fumes from the hazardous location traveling along the conduit lines into the non-hazardous area.

Make sure, then, that your electricians understand the importance of seals. Don't assume they know. Find out before your plant blows up. Without seals, all the additional money you paid for explosion-proof equipment may be poured down the drain.

**Another thing:** Do your electricians respond to all fire alarm signals? They ought to, because it's good practice to kill all electrical equipment in the vicinity of the fire. For two reasons:

One, you protect the men fighting the fire against accidental shocks from possible bare wires.

Two, by cutting off electric power before water hits the equipment, you'll save the equipment from short circuits and grounds resulting from wet insulation. Equipment can thus be dried out and restored to service. But, if power is not shut off, you'll end up with burned-out equipment and a high repair bill.

# *Fast... Efficient* Materials-Handling

*with* Colson® Casters

● The casters pictured here are only three of the nearly 1500 different types manufactured by COLSON to meet every industrial materials-handling requirements—*exactly.*

Old, bumpy, hard-to-handle equipment can easily be restored to its original efficiency with a saving of time and money.

Other cost-cutting materials-handling equipment by COLSON includes hand trucks, barrel and drum trucks, platform trucks and Lift-Jack systems. Write us or consult the yellow pages of your phone book (under "casters" or "trucks, industrial") for the COLSON office near you.

*Mail this Coupon today* →

**THE COLSON CORPORATION**
ELYRIA, OHIO
CASTERS • LIFT-JACK SYSTEMS • INDUSTRIAL TRUCKS

**THE COLSON CORPORATION**
**ELYRIA, OHIO**

*Please send my free copy of the new COLSON Catalog.*

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Position_____
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Address_____
City_____
Zone_____ State_____

# MAINTENANCE POINTERS

## FOR PLANT OPERATING EXECUTIVES

By CARL G. WYDER • Maintenance Editor, FACTORY

### Try This Rx for Low-Pressureitis in Your Compressed-Air Lines

If you're losing too much compressed air because of careless operation, this printed notice may give you ideas. It was posted in a plant suffering from low-air-pressureitis. And it got results.

Under the heading of "DON'T OPEN THAT VALVE"—in large letters—the author dealt out a bit of philosophy something like this:

"• Many of us don't stop to think that every time we open a compressed-air outlet, we're spending money. When you burn coal you see a flame, you feel heat, and you can pick up the ashes. You're reminded something is being consumed.

"• But not so with compressed air! When you let it escape you see nothing, you feel no residue. There's no measure of how much you wasted.

"• Compressed air isn't cheap. Actually it costs more than electricity or steam, because it must be produced in a machine driven by electrical or steam power. Since the compressor isn't 100% efficient, not all the energy value put into it shows up in compressed air. Also, you have transmission losses in the pipes, elbows, and valves."

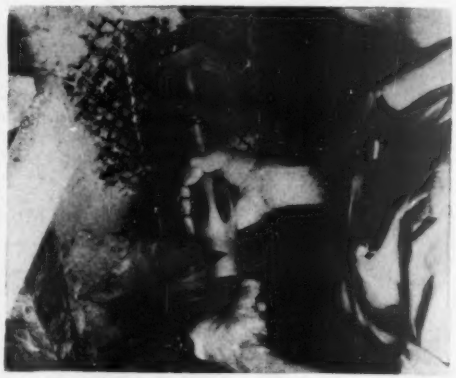
Our author, a maintenance executive, closed his appeal against air waste with this bit of free verse:

> "They say the air is free—
> yes, that's the air we breathe.
> But the air that's compressed
> is expensive and scarce, you see.
> So breathe all you want,
> but use caution and care
> when you open a valve
> and release compressed air."

### Getting Rid of Rats in Your Plant

We mean real rats, which cause thousands of dollars of damage to industry. Rat-proofing by building construction, says the U. S. Department of the Interior, is the only permanent answer. If you can't do that, trapping, poisoning, and other means are second best.

Principles of rat-proofing are described in Conservation Bulletin 19 on "Rat-Proofing Buildings and Premises." It's available under Catalog No. 1-1.72:19 from U. S. Government Printing Office, Division of Public Documents, Washington 25, D C., for 10 cents.



▶ Powder-operated tool for fastening wire mesh shows . . .

### . . . How Modern Tools Can Cut Plant Engineering Costs

The job here was to line a 96-ft. steel smokestack, 5½ feet in diameter, with fireclay. This lining was needed to reduce maintenance costs that resulted from deterioration and peeling of the paint. Smokestack belonged to the Midland Steel Products Company, Cleveland.

Problem was to fasten the wire mesh for supporting the fire clay to the stack. Various methods were considered—stud welding, drilling and tapping.

They were discarded in favor of the powder-operated Drive-It tool. It is easily portable, needs no power lines, and is simple to operate even in cramped quarters.

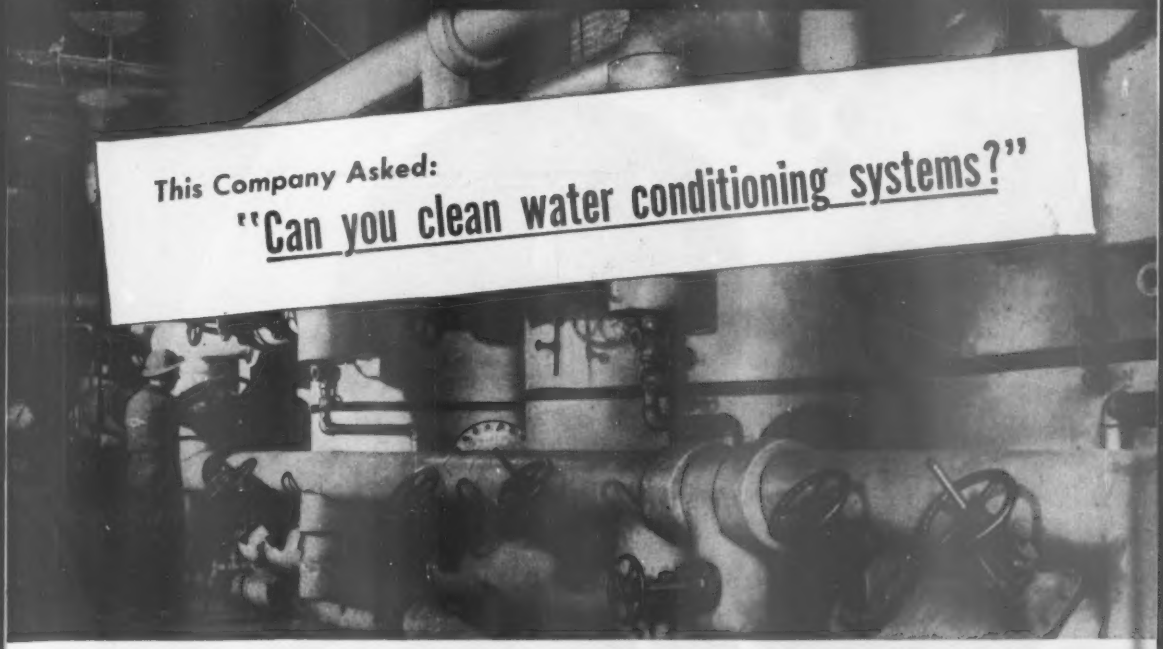
Ordinarily the drive pins used with this tool would penetrate the ⅜-in. boiler plate of the stack when driven for fastenings. So a special pin was developed that would not protrude from the outside, yet would hold the load.

These special pins were driven on 18x24-in. centers. Then the heavy wire mesh was attached and locked to the drive pins by using a Tinnerman speed nut on both sides of the mesh. Over 2000 pins were needed. After this the fireclay was plastered onto the mesh.

***Turn to page 244 for good ways to solve special plant engineering problems***

# DOWELL SERVICE

CHEMISTRY APPLIED TO MAINTENANCE CLEANING PROBLEMS




## Dowell Service has cleaned many types of water supply equipment FAST!

If deposits are cutting production and profits in your plant . . . Dowell Service offers an effective remedy! For example, in water supply and water treating systems, deposits may accumulate in pipes, pumps and filters . . . impairing operating efficiency. Maintenance men in many industries rely on Dowell Service to clean operating equipment . . . *without dismantling and with a minimum of downtime!*

Experienced Dowell engineers do the job, using Dowell-designed, truck-mounted equipment. Liquid solvents designed to remove deposits quickly, efficiently and economically are applied according to the techniques demanded by the job: for example, by filling, spraying, jetting, cascading or vaporizing. Often equipment can be cleaned in operation.

Let Dowell Service *save you time and money* in your maintenance cleaning! Call the nearest Dowell office today for FREE consultation.

***Recent Dowell jobs in Feedwater Systems***

**SCREEN FILTERS:** In less than three hours, Dowell Service removed 90% of deposits from filters used to screen river water for a 48" strip mill.

**WATER SOFTENER:** Approximately 18 inches of hard calcium carbonate piled up in the bottom of a water softener's deaerating compartment. In less than one day, Dowell Service thoroughly cleaned compartment.

**FILTER BEDS:** The backwash rate on an anthracite filter was reduced to 75 gallons per minute by accumulated deposits. After Dowell Service, backwash rate was increased to an effective 385 gallons per minute.

**ION EXCHANGE BEDS:** Iron oxide clogged an ion exchange water softener. Before cleaning, two pumps were required to provide pressure for adequate back wash. After Dowell Service, one pump was sufficient.

**FEEDWATER LINES:** Before cleaning, it was necessary to use three 100 horsepower pumps to force water through clogged feedlines to a boiler house. Following Dowell Service, only one pump was required.

**PUMP:** Two high pressure feedwater pumps were nearly clogged with deposits. Dowell service completely cleaned them along with rest of the feedwater system.

**WATER WELL:** Before treatment, a water well produced only 108 gallons per minute with a 35' drawdown. After Dowell acidizing, water flow increased to 450 gallons per minute with a 27' drawdown.

## DOWELL INCORPORATED • TULSA 1, OKLAHOMA

CALL

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| New York 20 | Ft. Worth 2 | Atlanta | Mt. Pleasant, Mich. |
| Boston 16 | Chicago 4 | Indianapolis | Hamilton, Ohio |
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| Richmond 19 | Wichita 2 | Ardmore, Pa. | Beaumont, Texas |
| Jacksonville 2 | Oklahoma City 2 | Anniston, Alabama | Borger, Texas |
| Buffalo 2 | Houston 2 | Hattiesburg, Miss. | Midland, Texas |
| Cleveland 13 | New Orleans 12 | Lafayette, La. | Wichita Falls, Texas |
| Pittsburgh 19 | Shreveport 69 | Dearborn, Mich. | Hobbs, N. Mex. |

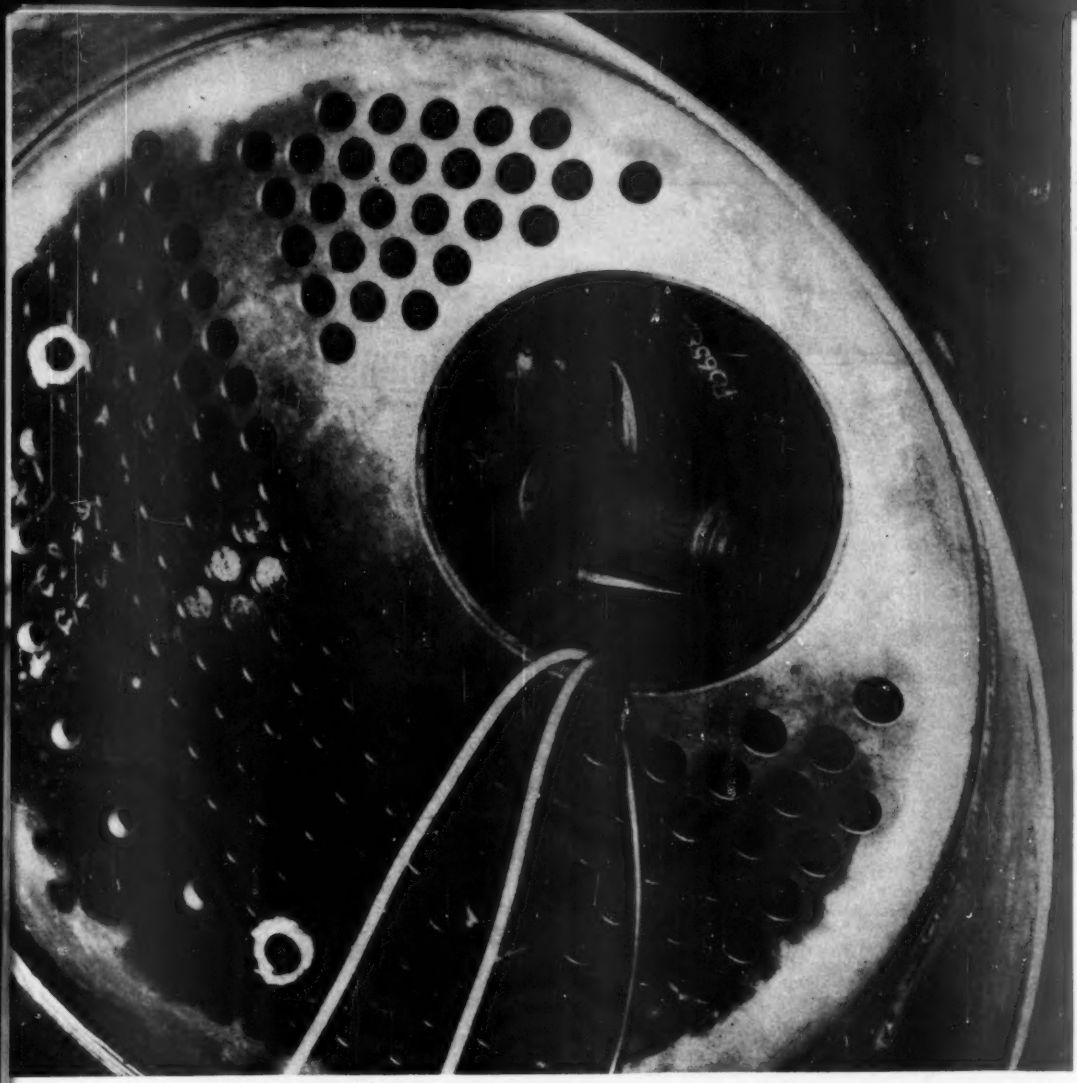
★ *Maintenance cleaning service for industrial heat exchange equipment.*

★ *Chemical services for oil, gas and water wells.*

DOWELL

*A Service Subsidiary of*

THE DOW CHEMICAL COMPANY



You can X-ray big jobs with ease. Welds inside this huge boiler are no problem for the lightweight tube head and long cables.

# X-rays Where You Want Them

YOU CAN ROLL the Resotron 250 industrial X-ray unit to an inspection job anywhere in your plant —and it packs a 250,000-volt wallop that can probe up to 3½ inches of steel.

Mobility and light weight mean lower costs for your production and maintenance testing—an important factor because material specifications are getting tighter and more customers are demanding specifications that can only be assured by X-ray. The versatile Resotron 250 keeps a searching eye on both your product and your equipment.

The easily-carried tube head looks like an ordinary industrial tank-type vacuum cleaner. It's about 15 inches in diameter and 44 inches long. And it weighs only 150 pounds as compared to the 1150-lb. average weight of conventional units of the same power.

Size and weight are reduced by a high-frequency resonant transformer that eliminates the iron core ordinarily used in X-ray units of this voltage. And gas insulation is used instead of heavy oil.

X-rays are emitted by a "snout" at the end of

You can X-ray small jobs with help of "snout" that reaches in and shoots "inside out." Note how operator holds film plate.

You can pack whole set-up into a compact trailer and take your X-ray machine to the job, instead of bringing job to machine.

the tube. A beryllium window provides the smallest possible focus spot.

The whole apparatus—tube head, control unit, water cooler, power supply, and 200-ft. cables—can be carried in a 6-ft. trailer. The entire outfit is weather-tight to enable outside storage.

You can operate the Resotron 250 on either a 220- or 440-volt, 3-phase, 60-cycle supply, throughout a range of 75 to 250 kilovolts peak and from 2 to 10 milliamperes tube current. And you can use it in temperatures from –35C. to +40 C., in humidities up to 100%.

**General Electric Company, Milwaukee 1.**

*Turn the page*

# WHAT'S NEW IN EQUIPMENT

**. . . BRIEFED HERE FOR THE CONVENIENCE OF PLANT OPERATING MEN IS INDUSTRIAL PLANT EQUIPMENT NOW ON THE MARKET . . .**


**AUXILIARY EQUIPMENT** . . . . . 150
**ELECTRICAL EQUIPMENT** . . . . . 158
**MAINTENANCE TOOLS & SUPPLIES** . . 166
**MATERIALS HANDLING** . . . . . 174
**MEASURING & CONTROL** . . . . . 184
**SAFETY & PLANT PROTECTION** . . . . 192
**VALVES & PIPING** . . . . . 196
**MISCELLANEOUS** . . . . . 198


**IN THE NEXT ISSUE** ..... **Some notes on important late items. More about them next month.**

**Weather-sensing unit,** called "Snow Detector," electronically controls de-icing heaters on your automatic rail switches, sidewalk and dock area snow removal systems.
Motorola Inc., 4545 Augusta Blvd., Chicago 31.

**Fuse handling safety** for high-voltage motor control gets an assist from a new fuse compartment in which current-limiting fuses are gang-mounted.
Electric Machinery Mfg. Co., Minneapolis 13.

**Loading dock shelters,** made of rugged canvas, protect your men and materials against bad weather. Extend to truck or freight car on steel framework that collapses flush against building when not in use.
Atlas Products Co., 1300 W. Washington Blvd., Chicago 7.

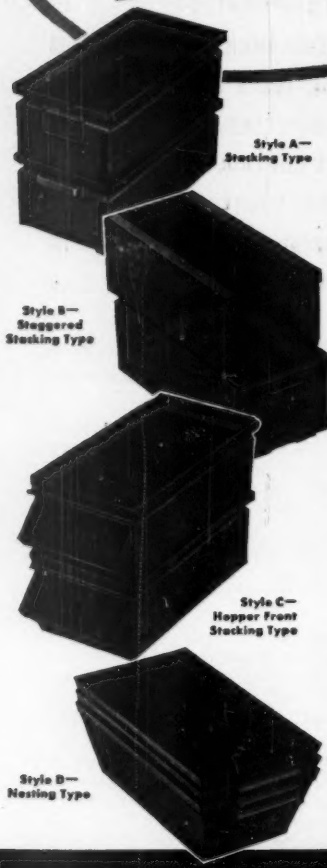
**Insect exterminator lamp** kills flying and crawling pests within 15,000-cu.ft. area with vapor that is practically odorless and harmless to humans. You just screw it into ordinary light socket. Doubles as a night light, too.
Solar Electric Corp., Warren, Pa.

**Pocket-size industrial tester** for checking electric circuits, spark plugs, motors, fuses, etc., packs a lot of use into a small package.
Ideal Industries, Inc., Sycamore, Ill.

# UNION METAL
# Steel Shop Boxes

## PROMPT DELIVERY

**...and you'll profit by these *plus* features!**




**1. CHOICE OF TYPES...** Shown here are four of the standard Union Metal shop box styles most commonly specified—ideal for most needs. *Continuously produced in volume, these popular, well-proved styles can be shipped on unusually short notice.*

**2. BROAD SIZE RANGE...** A *decided* advantage, these Union Metal boxes can be furnished in dimensions for your shop box needs.

**3. CONSTRUCTION...** Union Metal shop boxes are expertly engineered with many unusual features contributing to improved use and service such as integral wear runners, one-piece bottom-end construction, angle reinforced corners, full width hopper fronts, etc.

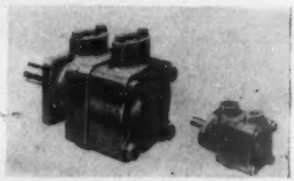
***Send for Folder MH-807A***

This folder gives additional information on Union Metal shop boxes including dimensional data, optional handle types and specially designed boxes for unusual services. Write to The Union Metal Manufacturing Company, Canton 5, Ohio.

## UNION METAL
*Materials Handling Equipment*


NEW AUXILIARY EQUIPMENT

*Begins on page 152*



### Oil Hydraulic Vane Motor

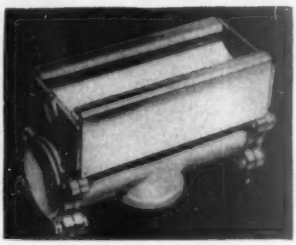
This unit is built to handle your most difficult service conditions. Rugged construction includes heat-treated alloy steel for shaft, rotor, and vanes.

Maker says an exclusive "rocking beam" feature keeps all vanes in contact with cam ring at all times.

You have choice of four combinations of inlet and outlet port positions; flange or foot mounting; and direct, belt, or gear drive. Available in 5-, 6.5-, and 26-hp. output.

**Vickers, Inc., 1400 Oakman Blvd., Detroit 32.**

■



### For Drying and Heating

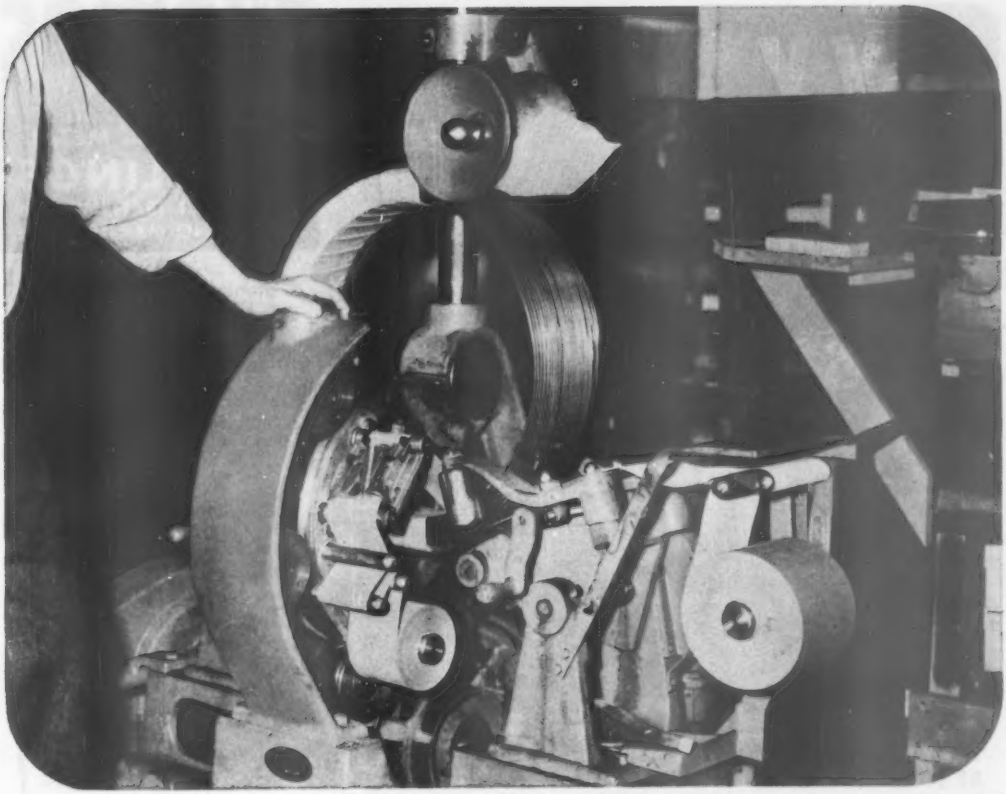
You get this unit custom-assembled from 9- or 12-in. sections to any length.

Proportioned gaseous fuels hit surface of specially designed ceramic refractories. Action of air-gas mixture is ignited and brings ceramic surface to incandescence.

You get intense radiant heat and penetrating infra-red waves emitted by ceramic surface.

**Drying & Heating Equipment Co., Inc., 51 Blake Ave., Brooklyn 12.**

*Turn the page*



Shell "VPI" Peripheral Wrap as applied to a coil of hard-facing alloys . . . saves expense of removing rust-preventive material . . . reduces packing costs.

# New packing technique HALTS RUST DAMAGE

## . . . cuts packing costs as much as 60%

THE GOOD WORD AMONG steel packagers and shippers today is that rust can now be prevented by Shell VPI® (a volatile corrosion inhibitor). Composed of solid amine nitrites, Shell "VPI" vaporizes and when moisture is present in the air . . . renders this moisture non-corrosive. Containers need not be airtight, however, for excellent corrosion protection.

In terms of packing costs, this new technique is so much simpler and faster that costs have been cut as much as 60%.

This can be traced directly to the fact that Shell "VPI" may be applied quickly and easily in either crystalline form or as a coating on wrapping paper. Hence rust-preventive measures are greatly simplified and container costs are reduced. And, of course, rust removal before the product's use is unnecessary.

Other major advantages of Shell "VPI" are: Low cost . . . Long periods of volatility . . . Non-toxic . . . Elimination of greasing and degreasing . . . Harmless to plastics or ferrous metals.

*Consult your Shell Representative about this new method of rust prevention today. Or write to nearest address listed below.*

**SHELL OIL COMPANY**

**50 West 50th Street, N. Y. 20, N. Y.**
**100 Bush Street, San Francisco 6, Calif.**

SHELL®

**SHELL "VPI"**

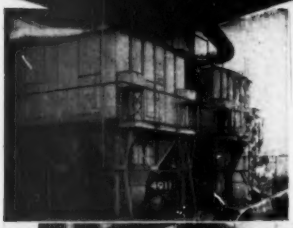
*(a volatile corrosion inhibitor)*

*stops air and moisture from making rust.*

# SLY

PIONEERS AND LEADERS IN

## DUST CONTROL



### WE CAN SAVE YOU MONEY BY COLLECTING YOUR DUST

Are you one of those who is still just *enduring* dust? If you are in dust, why not let a trained and experienced Sly engineer suggest a solution?

In *your particular industry* we have numerous operating installations. All of them are *saving* money for their owners–in cleaner plants, cleaner products, better personnel relations. Some of them are even *making* money by recovering valuable products.

With thousands of installations throughout the past 50 years, we have a wealth of experience in all industries. It is an exceptional background of value to anyone with a dust problem.

Yet — Sly costs *no more* (sometimes *less.)* May we send Bulletin 98 and discuss your dust problem with you?

**THE W. W. SLY MANUFACTURING CO.**

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New York • Chicago • Philadelphia • Syracuse
Detroit • Buffalo • Cincinnati • St. Louis • Minneapolis
Birmingham • Los Angeles • Toronto


NEW AUXILIARY EQUIPMENT

*Begins on page 152*

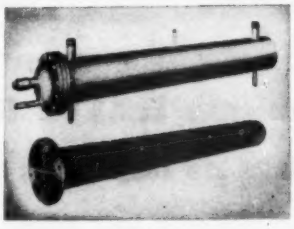
### For Heavy-Duty Steam Cleaning

Discharges up to 540 gph. of pressure detergent spray and hot or cold pressure rinse simultaneously.

Unit has 60-gal. detergent concentrate tank and 40-gal. fuel capacity. Operates on 220-volt, 60-cycle, single-phase current.

**Clayton Mfg. Co., El Monte, Calif.**

■



### Shell and Tube Liquid Cooler

This air conditioning or refrigeration unit gives you a certified working pressure of 150 psi. and is tested to 300 psi.

Refrigerant velocity is controlled for minimum pressure drop.

You can get 8- to 20-in. shell diameters in 2-in. increments and tube bundle lengths of 5 to 13 feet in 1-ft. increments.

**Taco Heaters, Inc., 137 South St., Providence 3, R. I.**

*Turn the page*


# THOMAS

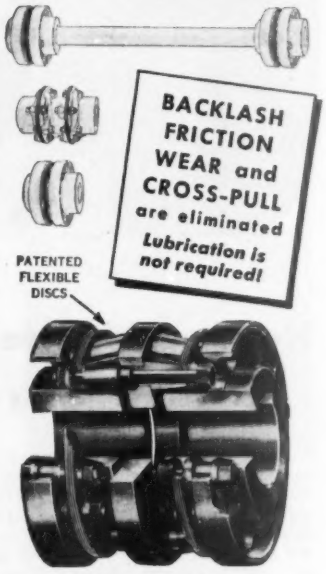
## *Flexible* ALL METAL COUPLINGS

FOR POWER TRANSMISSION
REQUIRE NO MAINTENANCE

**Patented Flexible Disc Rings of special steel transmit the power and provide for misalignment and end float.**

Thomas Couplings have a wide range of speeds, horsepower and shaft sizes:
½ to 40,000 HP
1 to 30,000 RPM

***Specialists on Couplings for more than 30 years***




THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT.

NO MAINTENANCE PROBLEMS.

ALL PARTS ARE SOLIDLY BOLTED TOGETHER.

*Write for the latest reprint of our Engineering Catalog.*

**THOMAS FLEXIBLE COUPLING CO.**
WARREN, PENNSYLVANIA

# NOW! 2 NEW HYSTER® LIFT TRUCKS

## Extra-Rugged for "INSIDE and OUTSIDE" Work

**Shorter, Narrower, Faster—with greater power and traction —and unmatched "Inside-Outside" versatility!**

6000-lb. CAPACITY

## HYSTER XA-60

***The ideal "INSIDE-Outside" Truck***

Shorter and narrower than any other 6000-lb. lift truck, embodies the *most* truck in the *least* space. A great "inside" truck — equally efficient outside for all-purpose operation. Pneumatic tires are easy on floors inside, give greater traction outside. The XA-60 will permit many plants to operate *one* truck in place of *two*. Write for Bulletin 1231.

**On display at your Hyster dealer**

8000-LB. CAPACITY

## HYSTER ZA-80

***The ideal "OUTSIDE-Inside" Truck***

Has long wheelbase, but SHORT OVER-ALL LENGTH — for smoother riding and high maneuverability. For use where most of work is *outside*, but truck is *also* required to work *inside* in close quarters. Extremely powerful, with tremendous traction, yet pneumatic tires assure maximum protection to floors. Write for Bulletin 1230.

## HYSTER COMPANY

THREE FACTORIES

2956 N. E. Clackamas..Portland 8, Ore.
1856 North Adams.....Peoria 1, Illinois
1056 Myers Street.....Danville, Illinois

**Be sure to get the whole Hyster "Inside-Outside" story before you buy *any* Lift Truck! Ask your Hyster Dealer, or write for Bulletins 1230 and 1231.**

# Backstand Belts Triple Production!

## Three times as many steel guides sanded per hour using ARMOUR Backstand Belts!

In sanding beveled edges of a steel guide for vending machines, a prominent company* decided to use backstand belts instead of set-up wheels. The switch *increased production from ten to thirty guides per hour!* Here is more proof that Armour backstand belts are more efficient, more economical than set-up wheels.

Belts are only one of the many forms of coated abrasives available to you from Armour. There are more than 30,000 different varieties in grit size, backing, etc. We have sheets, discs, rolls, tubes—and specialty sizes to meet your specifications. Your industrial supply distributor will be glad to tell you about this complete Armour line. Call him today!

Mail the coupon below for your free copy of our useful booklet, "Backstand-Belt Polishing."

*Name of company available on request.

**We recommend buying through your industrial distributor.**

ARMOUR

**MAIL THIS COUPON TODAY!**

**Armour and Company • North Benton Road • Alliance, O.**

Please send me the free booklet, "Backstand-Belt Polishing."

*Name*..... *Title*.....

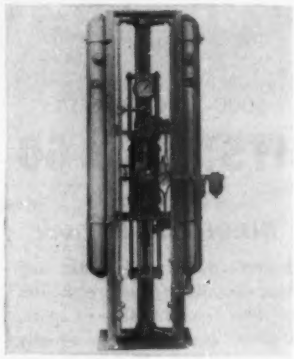
*Firm*.....

*Address*.....

*City*..... *Zone*... *State*.....


**NEW AUXILIARY EQUIPMENT**

*Begins on page 152*



### Air-Hydraulic Pump and Power Unit

Develops high fluid pressure from low air pressure directly from your plant's air supply. Suitable for operation of high-pressure cylinders, clamps, valves, actuators, and hydraulic presses; for safety installation and high-pressure testing for special hydraulic circuits requiring variable and adjustable pressure and volume; and for long pressure-holding cycles with quick approach without overheating or churning the hydraulic fluid.

Available in horizontal and vertical models.

**Ledeen Mfg. Co., 1600 San Pedro St., Los Angeles 15.**

■

### Underwater Pump

Slips right down into your well with tank and automatic controls at the surface. Makers say you get increased efficiency over ordinary pump systems and more water from greater depths. Most efficient at water levels 75 feet down or deeper.

Compact and easy to install, the new Uniflow "Diver" drowns pump noises in the well and needs no priming. You can get two models—¾- and 1⅛-hp.

**Uniflow Mfg. Co., Erie, Pa.**

*Turn the page*

# Acme Steel Strapping Insures S.A. *(Safe Arrival)*

***Reduces shipping cost, saves time and material, too!***

**OVER A MILLION HOTPOINT ELECTRIC RANGES** have been prepared for shipment with an Acme Steel pneumatic stretcher and pre-cut Acme Steel strapping shown being applied above. This practice has held shipping preparation costs as much as 20 per cent below normal appliance industry shipping costs and has eliminated a serious bottleneck while making the job easier.

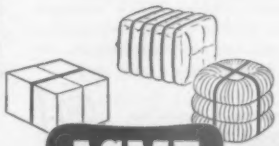
**PLASTIC TABLEWARE SETS FROM THE WEST COAST** are readied for shipment across the U. S. A. Acme Steel tool on top of cartons tensions, seals, and cuts strap in one quick operation.

**SCREEN DOORS FROM MILWAUKEE** can be shipped to markets anywhere protected with Acme Steel strapping. Half-a-dozen doors bound in this way give a pack of remarkable strength and saves labor as well.

Whatever you ship, from kitchen ranges to screen doors, chances are you can reduce shipping damage by securing with Acme Steel strapping.

The fact is that nearly everything made for any purpose anywhere, depends on steel strapping to insure Safe Arrival during its journey to the user.

But Safe Arrival is only part of the story. In case after case packing, loading, and shipping costs have been lowered—production assembly lines have been speeded up with Acme Steel strapping. Many striking examples are available. Write for them to Acme Steel Products Division, Dept. FM&M 122.



**ACME STEEL COMPANY**
2849 Archer Avenue, Chicago 8, Illinois

ACME STEEL

ELIMINATE GLUING TIME -cut costs!

use PRC SEGMENTED felt tapes with ADHESIVE BACKS!

PRC segmented tapes are defeating problems every day on assembly jobs requiring repeated use of equal-sized felt pieces. Each segment is as easy to tear off as a postage stamp from a roll. This cuts costly waste motion . . . saves time with each piece used. Segments of predetermined sizes also eliminate material waste. Adhesive back (either pressure-sensitive or solvent-activated) assures fast, positive application.

**Is this your problem...**

**Protection against corrosion?**

**Protection against dissimilar-metal corrosion?**

PRC Sealing tapes have special protective properties which safeguard your product against deterioration. Many sizes and impregnations are available for your specific needs.

PRC Write for descriptive literature.

**PRODUCTS RESEARCH CO.**

MFRS. OF CHROME LOCK AND KLING FELT TAPES

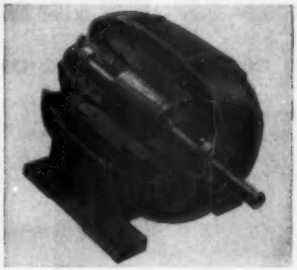
SUITE 112, 3126 LOS FELIZ BLVD.

LOS ANGELES 39, CALIFORNIA


WHAT'S NEW IN EQUIPMENT

*Begins on page 152*

# ELECTRICAL EQUIPMENT



## Screenless Motor With Positive Lint Expulsion

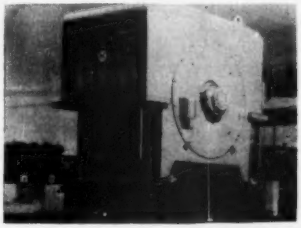
Lint-laden air enters both endshields through large intake openings and is discharged through openings located farther out in the same endshields.

Cooling fans, shaped to shed lint, force air and lint over end windings, smooth inside surfaces, then blow lint out of motor.

Standard ratings run from 2- to 15-hp. at 1800 rpm., 1½- to 10-hp. at 1200 rpm.

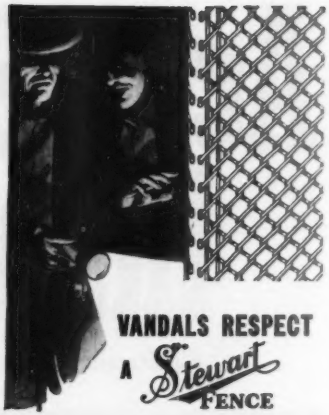
**General Electric Co., Schenectady 5, N. Y.**

■



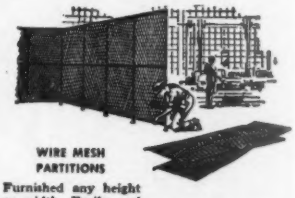
## Weather-Protected Motor

Unit is designed to keep wind-driven heavy moisture out of windings—and cut your outdoor installation troubles. Intake velocity is less than 600 fpm. so

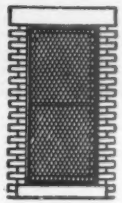
VANDALS RESPECT A Stewart FENCE

Every foot of unfenced property lines, every unprotected door, every window within reach of the ground, and skylights, too . . . all are potential points of entry. So why risk a visit from vandals or saboteurs? Surround your property with a Stewart Chain Link Wire Fence, and install the other Stewart products, some of which are illustrated below, designed specifically for protection against unwarranted trespass. Taking these precautions may prove the best investment you ever made. Write for catalog No. 85.



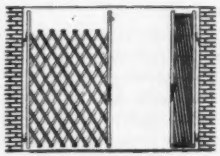
**WIRE MESH PARTITIONS**

Furnished any height or width. Easily and quickly erected. When writing for prices, please give all measurements involved.



**WINDOW GUARDS (Wire or Iron)**

Made with round or channel frames to fit any size or shape opening. When requesting prices, please give measurements and send diagrammatic sketch.



**STEEL FOLDING GATES**

Made in single or double gate construction to fit any width opening. Prices on request. Please give width and height of opening.

**THE STEWART IRON WORKS CO., INC.**

1956 Stewart Block Cincinnati 1, Ohio

*Experts in Metal Fabrications Since 1886*

Stewart IRON and WIRE FENCES

offices . . . factories . . . schools . . . hospitals . . . laboratories
change characterizes the modern building
moving masonry walls
moving Mills partitions
speed and facility of erection
low maintenance cost
some recent Mills installations

# *Mobilized interiors* solve your layout problems today and tomorrow

## . . . this Book of Facts shows you how

**A PRACTICAL BOOK *for* BUSINESS EXECUTIVES**

*We'll be glad to send you a free copy of this 48-page book. Just ask for Mills Movable Metal Walls Catalog No. 53.*

● No matter how perfectly your layout meets *present* needs, it will be truly efficient only if it can be quickly, easily and economically adapted to *changes* in space requirements. Such changes are inevitable—and they occur far sooner and much more frequently than is generally realized.

Mills Movable Metal Walls, for over thirty years the demonstrably superior system of flexible interiors, are today's efficient answer to this problem. Attractively modern in design and finish, of all-welded steel construction, they are structurally strong, completely incombustible, fully insulated and thoroughly soundproofed. Yet they are easily installed and can be quickly moved to fit new layouts—frequently in a matter of only a few hours—at very low cost.

**THE MILLS COMPANY, 945 WAYSIDE ROAD, CLEVELAND 10, OHIO**

**MILLS *Movable* METAL WALLS**

**. . . You'll also find this catalog in Sweet's File, Architectural, for 1953.**

THEN . . .
• 50 hp Motor
• 600 amps and Up Starting
• 75 to 225 amps Running Variation
• Shock Starting
• Excessive Belt Wear
NOW
• 40 hp Motor
• 425 amps
• 125 amps Constant
• Smooth Starting
• Minimum Belt Wear
Production Up . . . Cost Down

That's what happened at Sonken Galamba Corporation, Kansas City, Kansas, since mid-1951 when a power-smoothing Twin Disc HYDRAULIC COUPLING was installed on the Ball Mill which grinds aluminum slag for reprocessing.

Starting this large metal tumbler filled with steel balls was tough on motor and mechanical clutch. The 21" Twin Disc Hydraulic Coupling replaced the clutch; later a 50 hp motor was replaced with one of 40 hp. It formerly took 600 or more amps to start; running current jumped crazily between 75 and 225. Now it starts smoothly at 425 amps and sings along at an even 125. And belts last much longer.

The story's the same whenever Twin Disc's motor and machine saving Hydraulic Couplings are in use—and that's *throughout* industry. Write for Bulletin No. 144-B.

No more bumps in this grind—since power surges, motor damaging shocks were smoothed out by a Twin Disc 21" Double Circuit Hydraulic Coupling. Available from fractional hp to 700 hp in wide choice of mountings and housings.

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • SEATTLE • TULSA


## NEW ELECTRICAL EQUIPMENT

*Begins on page 158*

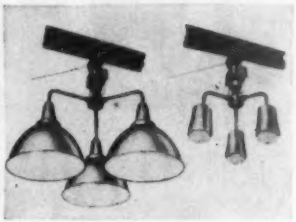
heavy rain cannot be drawn in.

Screens over intakes keep out papers, leaves, etc. You can get more protection by installing air filters.

No special concrete foundation or base is needed. Covers full range of ratings for major auxiliary drives, including boiler feed pumps.

**Allis-Chalmers Mfg. Co., Milwaukee 1.**

■



### 3-Lamp Cluster

Meets your need for more light without requiring installation of additional outlets. Suspends reflector or conventional lamps weighing up to 10 pounds each.

And you can get a disconnecting and lowering hanger for quick, easy servicing at floor level.

**Thompson Electric Co., 1121 Power Ave., Cleveland 14.**

■

### Precision Toggle Switch for Multiple Circuits

Precision and high vibration resistance describe the new Micro multiple circuit toggle switch.

You can get assembly with one to 10 double-throw switching elements all operated by a single lever. And the lever may be locked in the center, at either or both extreme positions. Or it may automatically return to center.

Switch is UL-approved and rated at 10 amperes up to 250 volts a-c. It will handle 30-volt d-c inductive loads at 10 amperes.

**Micro Switch, Freeport, Ill.**

*Turn the page*

# Another LONG-LIFE, LOW-COST, LIGHT-WEIGHT ROOF OF U·S·S 17 (TYPE 430) Stainless Steel

U·S·S 17 (Type 430) Stainless Steel is today's big news in the field of industrial construction. Recent months have seen a steadily increasing use of this long-lasting, maintenance-free, light-weight material that offers an unbeatably low cost per year.

A typical example is the new office structure of The Heppenstall Company in Pittsburgh, Pa. Two existing buildings and the space between were enclosed to form a new structure 86′ x 100′ and U·S·S 17 Stainless Steel was used for the roof, the flashing and the parapet. The walls, too, are straight-chromium Stainless Steel.

For any building that must go up to stay up, U·S·S 17 Stainless Steel is one of the most economical materials available today for walls and roofs. It will give you a service life several times that of less durable materials . . . free from recurring maintenance charges . . . free from painting. The corrosion resistance of this straight-chromium grade of Stainless has been proved in installations more than a quarter of a century old.

Strong, corrosion-resistant Stainless Steel can be used in lighter gages than other materials. Wall and roof panels can be installed quickly and easily.

Straight-chromium grades of Stainless Steel are in unrestricted supply today. If you are planning a new building, get all the facts on this long-lasting material now. Mail the coupon for our free booklet.

Roof panels of 24 gage straight-chromium Stainless Steel were used on this building of The Heppenstall Company, Pittsburgh, Pa. Fabrication and erection was done by Limbach Company, Pittsburgh.

The parapet, roof flashing and gutters of the building are also straight-chromium Stainless Steel.

Straight-chromium Stainless Steel was also used for the wall panels that enclose the new office structure of The Heppenstall Company.

USS

United States Steel Company
Room 2807-B, 525 William Penn Place
Pittsburgh 30, Pa.

☐ Please send me your booklet, "U·S·S 12, U·S·S 17 Stainless Steel Walls and Roofs for Industrial Buildings."

☐ Please arrange to have fabricators of Stainless Steel wall panels send me literature on their particular type of construction.

Name .....Title .....

Address .....

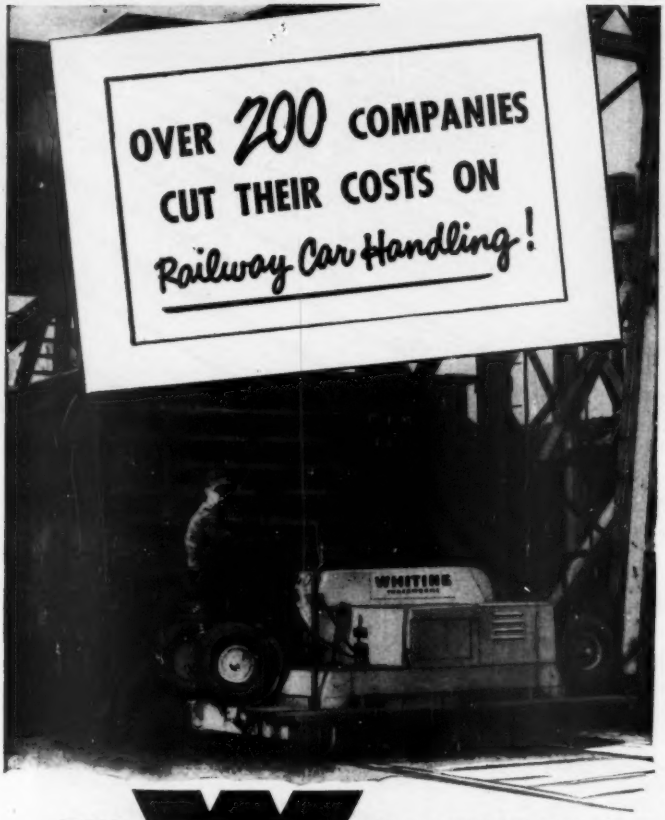
City .....State .....

UNITED STATES STEEL COMPANY, PITTSBURGH · AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO · NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

**U·S·S STAINLESS STEEL**

SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

UNITED STATES STEEL




THE WHITING TRACKMOBILE

**PROVED AT THE REFINERY**

Standard Oil Company (Ind.) saves time on car moving and spotting at its Whiting refinery!

**PROVED AT THE GRAIN ELEVATOR**

Anderson Elevator Co., Maumee, O., speeds grain car loading and unloading!

**PROVED AT THE COAL MINE**

Coal by the carload . . . moved by the minute! Peabody Coal Company uses Whiting Trackmobiles to speed coal loading and car handling during construction of its new mine at Pawnee, Ill. . . gains important savings in time and manpower. Other leading firms from coast to coast are achieving new efficiencies in car moving, spotting and switching . . . using Trackmobile *flexibility* to speed production, reduce demurrage and make manpower more productive. Whether you're handling cars of coal or candy, steel or sand, the Trackmobile can help you!

**GET THIS NEW, OPERATION REPORT!**

See the complete story on the Trackmobile at Peabody . . . facts of value to any industry seeking new economy in car handling. Ask for your copy today!

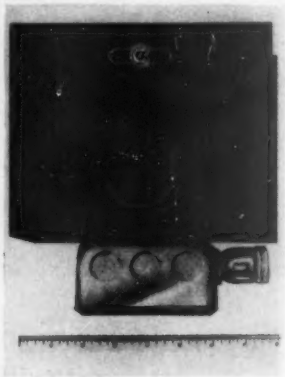
**WHITING CORPORATION**

15689 Lathrop Ave., Harvey, Illinois

Other Whiting Handling Equipment: Overhead Cranes • Economy Cranes • Electric Chain Hoists • Trambeam Overhead Handling Systems


## NEW ELECTRICAL EQUIPMENT

*Begins on page 158*



### Selenium Rectifier

This d-c power supply is designed for installation at individual work stations. Comes in two models, 300 and 500 watts, operating from 115-volt, 60-cycle line.

Gives you from 90 to 135 volts of filtered d-c output which can be varied in approximately equal steps by 5-step switch. Output ripple is less than 5% at full load.

Can be mounted on bench or wall and comes with either an input and output conduit box or line cord input and polarized plug output.

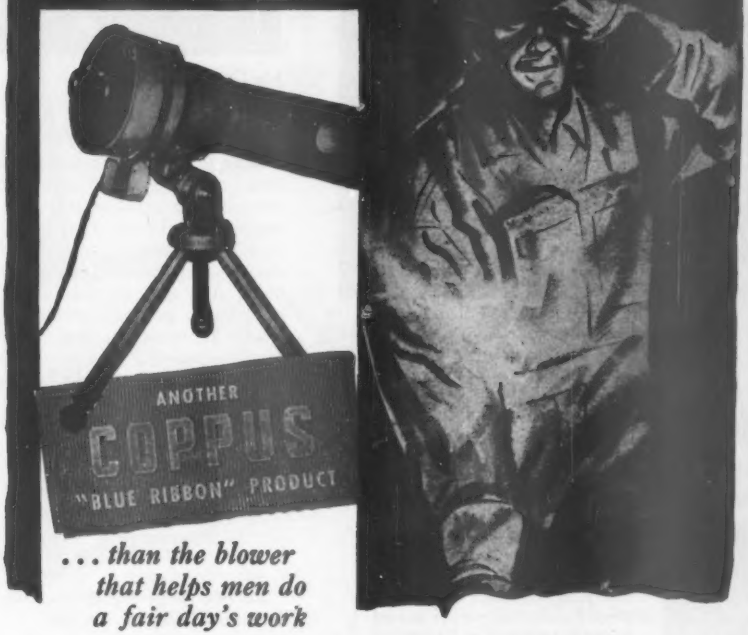
**Rapid Electric Co., 2881 Middletown Rd., New York 61.**

■

**SMALL-GAGE WEATHERPROOF EXTENSION WIRE FOR ELECTRONIC INSTRUMENTS** is announced by Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne & Windrim Aves., Philadelphia 44. The new 2-conductor wire is said to increase the total footage you can get from alloy allotted to your company and makes it possible for you to use more wires per conduit. Each conductor has 1/64-in. coat of polyvinyl chloride, and both conductors are covered over-all with cotton braid impregnated with asphaltic base weatherproof saturant.

*Turn the page*

# Down time due to FOUL AIR adds more to your costs...




*... than the blower that helps men do a fair day's work*

Speed fresh, cool air into a furnace, manhole, tank or other confined area where men must work and you'll get faster, better work in return.

There's a portable, easily adaptable Coppus Blower or Exhauster for just about any problem caused by stagnant, hot or fume-filled air. The Blue Ribbon stands for precision engineering that assures peak performance at lowest cost. Check and mail the coupon today for the information that fits your particular problem. Sales offices in THOMAS' REGISTER. Other "Blue Ribbon" Products in CHEMICAL ENGINEERING CATALOG, REFINERY CATALOG, BEST'S SAFETY DIRECTORY, MINING CATALOGS.

OTHER
**COPPUS**
"BLUE RIBBON"
PRODUCTS

HORIZONTAL TURBINE
Six frame sizes
1 to 150 horsepower

VERTICAL TURBINE
Six frame sizes
1 to 150 horsepower

FANMIX GAS BURNER

FANMIX GAS-OIL BURNER

***MAIL THIS COUPON*** To Coppus Engineering Corp., 112 Park Avenue, Worcester 2, Mass.

**PLEASE SEND ME INFORMATION ON SUPPLYING FRESH AIR TO MEN WORKING:**

- ☐ in tanks, tank cars, drums, etc.
- ☐ in underground cable manholes.
- ☐ in aeroplane fusilages, wings, etc.
- ☐ on coke ovens.
- ☐ on steam-heated rubber processes.
- ☐ on boiler repair jobs.

COOLING:

- ☐ motors, generators, switchboards.
- ☐ wires and sheets.
- ☐ general man cooling.
- ☐ around cracking stills.
- ☐ exhausting welding fumes.
- ☐ stirring up stagnant air wherever men are working or material is drying.
- ☐ drying of walls, sheets; etc., after treated with coating material.

NAME .....

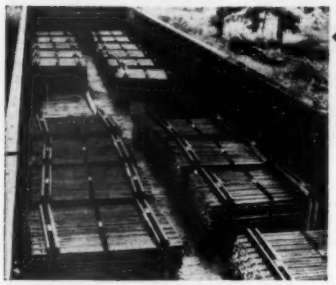
COMPANY .....

ADDRESS .....

CITY .....

(Write here any special ventilating problem you may have.)

**HORRIBLE EXAMPLE.** These gun barrel blanks were shipped in wire-bound bundles which were improperly bundled and braced in the gondola. *Results:* barrel ends were damaged, and the entire shipment was in shambles. Many man-hours were required to recooper the bundles before they could be unloaded.



**WISE SOLUTION.** At the suggestion of a Signode fieldman, the next shipment was bundled by the tested and approved* method shown here—with heavy-duty *Signode* steel strapping. *Results:* Shipment received in perfect condition. Crane was able to unload car rapidly because each bundle was still intact, thus saving time and labor.

**Do this now—to insure against similar losses...**

*First, send for a Signode fieldman!* You will be under *no* obligation. His advice will be sound. It is based on *experience*—and backed by the engineering facilities of Signode! His tested and approved* recommendations are sure to result in improved packaging and shipping methods, and profitable economies in materials used, manpower and time. Write today for the services of a Signode fieldman!

*Another exclusive service proved and tested for you by Signode

**SIGNODE**

Steel Strapping Company
2663 N. Western Ave., Chicago 47, Ill.

*This Seal means security in shipping*

Offices coast to coast. *In Canada:* Canadian Steel Strapping Co., Ltd.
Foreign Subsidiaries and Distributors World-Wide


NEW ELECTRICAL EQUIPMENT

*Begins on page 158*

## Molded Nylon Cable Hangers

Here's an item you've been looking for—a nylon cable hanger with smooth, rounded edges and non-abrasive surfaces that won't damage insulation. Called Nyloclips, they're not affected by oils, gasoline, alcohol, or hydraulic fluids. And they are insulators—can't cause grounds, shorts; are free from hysteresis loss. Withstand temperatures from −60 to +250F. To top it all, they're 70% lighter than comparable metal clips. Sizes for cables from 3/16- to 2-in. diameter

Several sizes have 2- or 3-hole tongues to permit diameter adjustment when installing—give you all the size range you need. Write manufacturer for additional information.

**Burndy Engineering Co., Inc., Norwalk, Conn.**

■

## Generating Plant for Standby Service

Features a 4-cylinder air-cooled engine—no water cooling system to increase your maintenance expense.

Unit is available with electric starting or can be supplied with controls that automatically start plant the instant regular power fails.

Capacity is 10 kilowatts. And you can get generator for single-phase or 3-phase service at either standard or special voltages. For more detailed information, write maker for bulletin DHE-1.

**Universal Motor Co., 494 Universal Dr., Oshkosh, Wis.**

*Turn the page*

# What do you do when it takes hours... sometimes days... to change v-belts?

**1** **Put one or several maintenance men on the job**

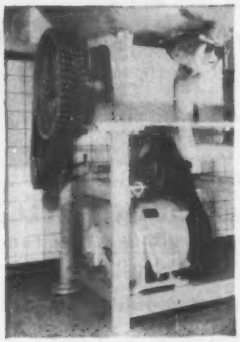
...and pay for repairs while production stands still

**2** **Pay overtime**

...and have repair costs eat away your profits

**3** **Standardize on VEELOS...**

...and change belts in up to 1/10th the time
...save labor, save time and save overtime
...keep machines producing for maximum profit



***Comparison proves the value of VEELOS...***

**Minimum Inventory**—4 reels of Veelos in the O, A, B and C widths can replace up to 316 different sizes of endless v-belts. If you use only one width of v-belt you can stock just one reel of Veelos.

**Quick Installation**—link construction makes it unnecessary to remove outboard bearings.

**Complete Adjustability**—vibrationless, full power delivery is assured because uniform tension on each belt in a matched set can be maintained.

**VEELOS**
THE LINK
**V-BELT**

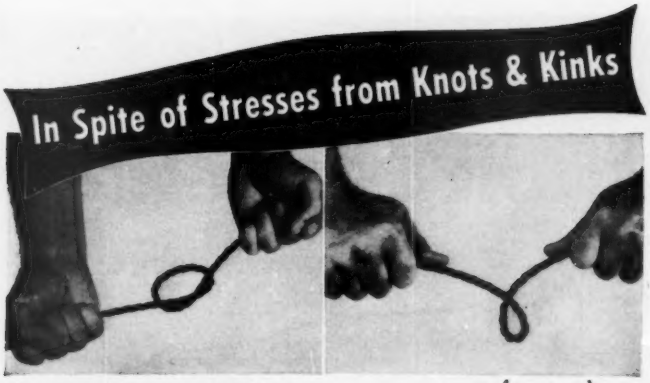
**VEELOS DATA BOOK**

gives complete details on construction, installation and uses. We'll gladly send you a free copy of this 28-page fact-full book... write today.

**MANHEIM MANUFACTURING & BELTING COMPANY**
604 Manbel St., Manheim, Pa.

**ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE**

Made in all widths in three types: regular, oil-proof, static conducting. Also in double V in O, A and B. Packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. VEELOS is known as VEELINK outside the United States.




# Tuffy SLINGS

## Last Longer to Help You Cut SLING COSTS

**BRAIDED CONSTRUCTION is the Reason!**

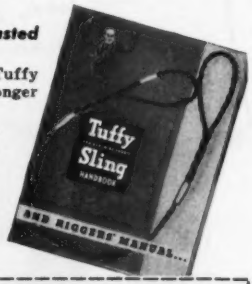
Knot it! Kink it—if you can! See how easily the patented braided construction of Tuffy Slings straightens out without damage. Only Tuffy gives you this extra flexibility and long-life strength—because ONLY TUFFY has this 9 part machine-braided wire fabric construction that fights off knots and kinks, yet stands up longer when such stresses of distortion happen. Mail coupon for your FREE 3-ft. sample of Tuffy Sling fabric and test it yourself!

**A Steel Company Reports: "...outlasted former slings 3 and 4 to one."**

One month's service was tops—until Tuffy showed how they could get 3 and 4 times longer service—at big savings on sling costs.

**SEND FOR THIS FREE BOOK!**

Get the facts—and save! Here's useful data on 12 braided sling types . . . various types of sling fittings, 30 illustrations of sling uses, information on splicing Tuffy Slings and Wire Rope. It's yours for the asking! Mail coupon today!




**union** Wire Rope **corporation**

*Specialists* *In Wire Rope and Braided Wire Fabric*

**2234 Manchester Ave., Kansas City 3, Mo.**

☐ Send FREE Tuffy Sling Handbook and Rigger's Manual

☐ Have my Union Wire Rope Fieldman deliver to me FREE a 3-Ft. sample Tuffy Sling

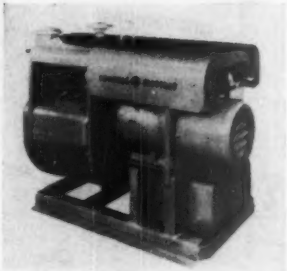
*Firm Name*_____

*By*_____ *Title*_____

*Address*_____ *City*_____ *State*_____




# MAINTENANCE TOOLS & SUPPLIES



## Engine-Driven Arc Welder

G-E's new d-c welder (WD-42AGW) has a current range of 40 to 250 amps with a 60% duty cycle at rated load. You can use it with a variety of electrode sizes on your maintenance, repair, and construction jobs.

It's designed to fit crosswise in a standard pickup truck, or you can get a trailer as optional equipment.

**General Electric Co., Schenectady 5, N. Y.**

■

## Liquid Neoprene Protective Coating

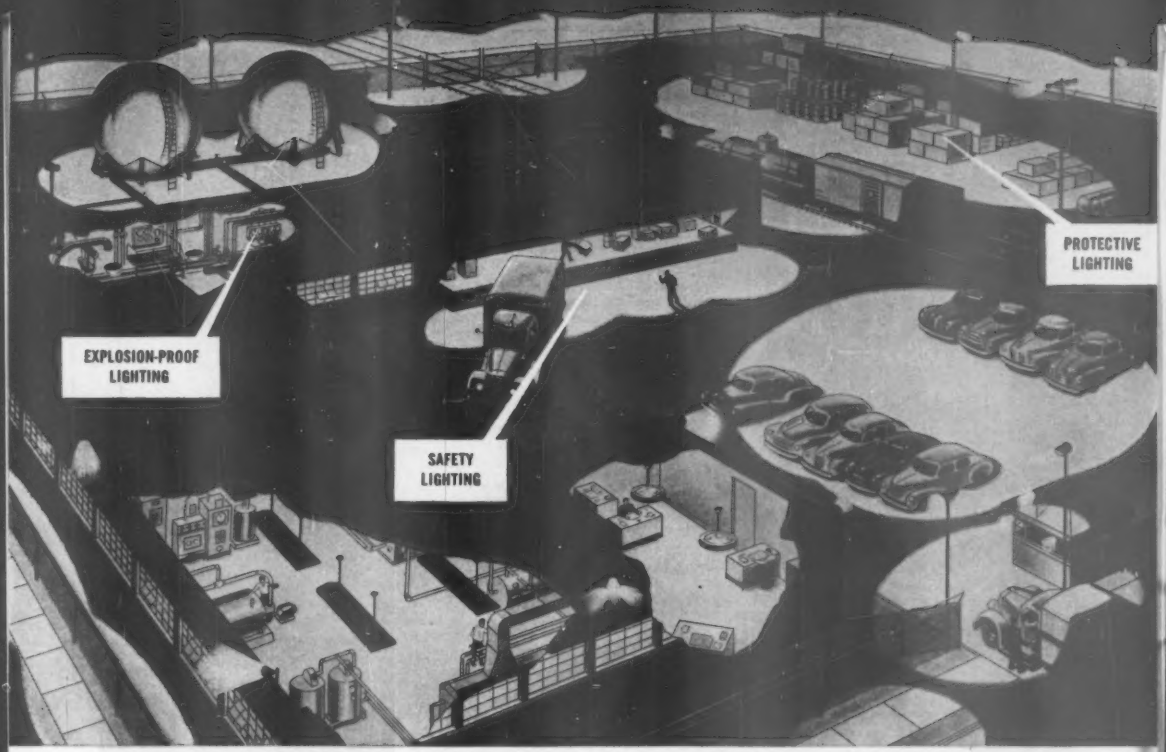
You can brush, dip, or spray the new Proco Liquid Neoprene Coating. It gives you protection for industrial maintenance work on structural steel, concrete, wood, and other surfaces.

Features are: exceptional resistance to oil, grease, and chemicals; resistance to age-cracking by weather; resilience; elasticity; resistance to abrasion, chipping, and cracking.

Air-cures at normal temperatures but will not gel in container.

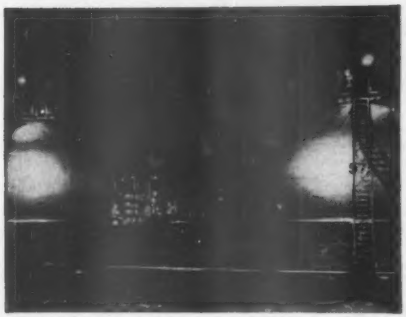
**Moore & Co., 1 E. Putman Ave., Greenwich, Conn.**

*Turn the page*




**PUT GRAYBAR'S LIGHTING EXPERIENCE TO WORK FOR YOU** You can count on Graybar for accurate, helpful information on any of these typical lighting installations. We'll be glad to work with you in planning practical solutions to the more specialized applications of protective lighting, safety lighting, and explosion-proof lighting. The fixtures and wiring materials they require can be conveniently secured through your near-by Graybar office.

# How to simplify complex lighting projects



**Lighting hazardous locations** in refineries, chemical plants, and plant fueling stations, for example, requires specialized techniques. A Graybar Lighting Specialist will help you select lighting units and fittings to provide maximum protection against the danger of explosion.

If the lighting project you're planning is a specialized application, it will pay you to call in a Graybar Lighting Specialist. He's ready to help you or your electrical contractor analyze and develop layouts for all kinds of protective and explosion-proof lighting.

But, no matter what the job — when it first comes up — *that's* the time to contact your local Graybar Representative. Let *him* furnish the delivery, price, and specification data you need to make up project estimates and job schedules. You'll get it fast, too, because Graybar people have this sort of information right at their fingertips. Later on, it's a simple matter to write out a single order for all the fixtures, wire, and fittings you need — saves dollars both in time and paper work.

Remember, Graybar distributes over 100,000 different electrical items, including the most complete selection of lighting units and lamps available anywhere. In fact, it pays to check with Graybar for *everything electrical* — for wiring, power, ventilation, and communication, as well as lighting. 201-1112

**Graybar Electric Co., Inc.**
**Executive Offices: Graybar Building**
**420 Lexington Ave., New York 17, N. Y.**

*Get convenience, service, reliability . . .* via GraybaR

IN OVER 100 PRINCIPAL CITIES

# Count on Clark for Cutting Costs

CLARK
MATERIALS HANDLING EQUIPMENT

You'll find this sign of your nearby authorized Clark dealer under "Trucks" —Industrial" in the Yellow Pages of your 'phone book.

## through EFFICIENCY...

No matter what your product may be, it's a safe bet that Clark Materials Handling Equipment can lift it, move it, load it or stack it better, faster, and at lower cost. That's saying a lot . . . but ask any Clark user. He'll tell you that Clark cuts the cost of handling. For example, "The average savings of four large worsted mills that are using (Clark) equipment is $400.00 a week."—quote from article in TEXTILE WORLD by M. J. Koroskys.

## through USEFULNESS...

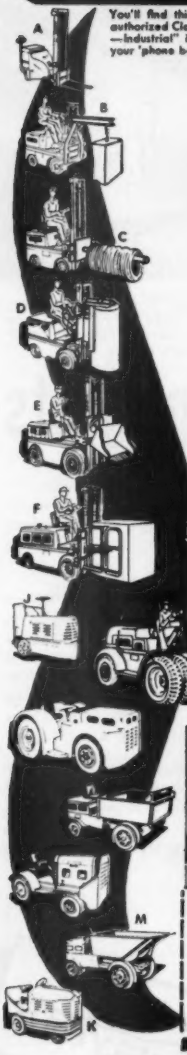
There's no end to the usefulness of the Clark line of fork-lift trucks, powered hand trucks and industrial towing tractors . . . special attachments facilitate quick switching from one job to another . . . no idling while "waiting for work" . . . odd sizes and shapes handled easily and safely . . . your choice of power types—gas, diesel or electric battery.

## through ECONOMY...

Clark Equipment saves time . . . multiplies manpower . . . reduces handling time. Clark high-tiering increases usable warehouse space . . . cuts storage costs. And the many important Clark features plus Clark precision engineering insure remarkably low operating costs.

## through SERVICE...

Clark Equipment gives service . . . years of it. But remember, the equipment that *gives the most* service is that which *gets the best* service. That's why you'll always find a Clark Service Dealer near you capable of handling the most complex repair or overhaul job . . . with a line of genuine Clark replacement parts . . . and a crew of factory-trained experts to serve you . . . *promptly.*




√ Be sure to see us at the
**PLANT MAINTENANCE SHOW**
Cleveland, January, 19-22, 1953 • Booth Number 1001

A Electric-Powered HAND TRUCK with Stacker. B TRUCLOADER with CRANE Attachment—1000 lb. cap.—gas or electric power. C CLIPPER with RAM Attachment—2000 lb. cap.—gas or electric power. D CARLOADER with BARTEL Device—3-4-5000 lb. cap.—gas or electric power. E YARDLIFT with SHOVEL Attachment 2-4-6000 lb. cap.—gas power only. F UTILITRUC with CLAMP Attachment 6-7-10,000 lb. cap. —gas or electric power. G YARDLIFT—150 with Standard Forks 15,000 lb. cap.—gas power only. H CLARKTOR—100-10,000 lb. draw bar pull. I CLARKTOR—47 to 104 tons hauling capacity on level. J CLARKETTE—5-10 tons hauling capacity on level. K CLARKAT—42 to 58 tons hauling capacity on level. L TRUC-TRACTOR—Dump model 4000 lbs. capacity. M TRUCTRACTOR —Tip-model 4000 lbs. capacity.

CLARK ELECTRIC AND GAS POWERED FORK TRUCKS
AND POWERED HAND TRUCKS • INDUSTRIAL TOWING TRACTORS

INDUSTRIAL TRUCK DIVISION • CLARK EQUIPMENT COMPANY • BATTLE CREEK 12, MICHIGAN
Please send: ☐ Movie Digest ☐ Safety Saves ☐ New Condensed Catalog ☐ Material Handling News
Name
Firm Name
Street
City Zone State


NEW MAINTENANCE TOOLS & SUPPLIES
*Begins on page 166*

Insert wire ends, squeeze handles, and . . .

. . . get this weld in a few seconds with a . . .

## New Device for Cold-Welding

You can weld non-ferrous metals without heat, flame, electricity, acids, fluxes, or chemicals in a matter of seconds with the new Utica Koldweld. Gives a big boost to the use of aluminium in electrical wiring.

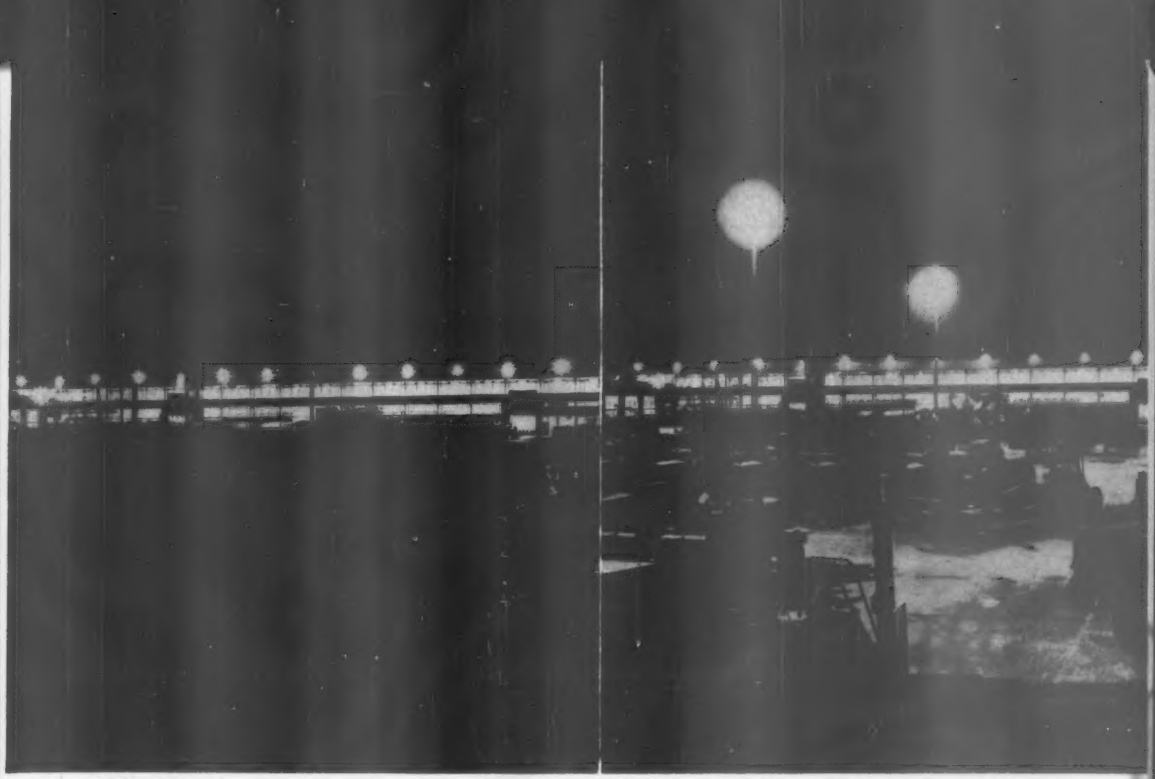
Above picture of enlarged wire section shows you results of a butt-weld. Broken end at left shows where wire gave under tensile test while weld remained firm. Inter-molecular flow gives compact bond said to have greater tensile strength than wire itself.

No flame or heat means greater safety. Also, joints won't twist or couple and are same gage as wire.

You can use Koldweld on wires up to 0.070-in. diameter.

**Utica Drop Forge & Tool Corp., Utica 4, N. Y.**

*Turn the page*

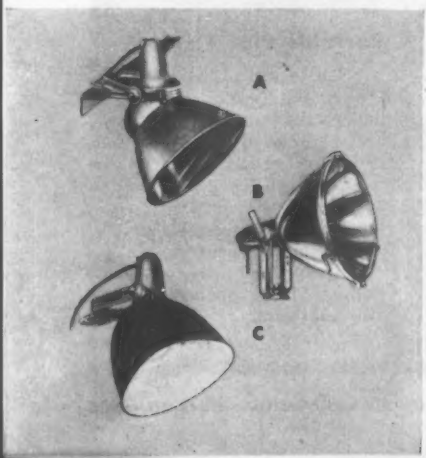


**BEFORE** manufacturer extended work day to two-shift operation this large outdoor area was used for storage only. But . . .

**AFTER** 24 G-E heavy-duty floodlights were installed in the outdoor yard, increased illumination and better visibility brought . . .

# 'Round-the-clock daylight for easier more efficient materials handling . . .

**A LIGHT FOR EVERY NEED** is available from G.E.'s full line, for example: A High efficiency, lightweight, easy-to-install area floodlight for crossarm mounting, wide three beam spreads; B Heavy-duty, wide variety of mountings and beam spreads; C Inexpensive, open floodlight for closer-range illumination.




## AND EUCLID ROAD MACHINERY CO. DOUBLED USE OF STORAGE AREA

To complete their new plant-wide, two-shift operation, the Euclid Road Machinery Co., large manufacturer of equipment for moving rock, ore, and earth, installed G E floodlighting in its outdoor storage area. Now, their assembly lines are fed an uninterrupted supply of materials quickly and efficiently, at night as well as during the day.

**MORE SAFETY, MORE PROFIT.** "Workers appreciate the extra safety and more pleasant working conditions afforded by G-E floodlighting. It enables them to handle materials with minimum damage and confusion, bringing maximum speed and profit to our operation," says D. L. Lawrence, Plant Engineer.

**LOW COST.** An investment in outdoor lighting is insignificant compared to either your present investment in outdoor work areas or the increased productivity which G-E outdoor lighting achieves for you.

**FOR INFORMATION** on how you can make storage areas usable at night, speed the flow of materials along plant roadways, or facilitate work at loading docks and platforms with G-E outdoor lighting, write for bulletin GEA-3640, to Section 451-175, General Electric Company, Schenectady 5, N. Y.

*OUTDOOR INDUSTRIAL LIGHTING*

**GENERAL ELECTRIC**

*"If we use an Indicating Gage, we can reduce the cost of this workpiece!"*

All Purpose Indicating Snap Gage

Because an Indicating Gage can reduce the number of pieces otherwise produced *oversize*, and still others that would be *undersize*, the Gage will pay for itself—and go on saving rework and scrap money.

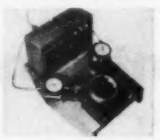
Furthermore, *Indicating* Gages enable the machine operator to produce faster with greater surety of dimensional accuracy. The operator can *see* how he's doing; he is not working blind.

The *price* of a Gage really bears little relation to its *cost* to the owner. A Federal *Indicating* Gage can really cost you nothing. Moreover, *after* it has paid for itself, it goes on saving you money and protecting your quality.

Give your production men a break. Let them *see* their way to better production with Indicating Gages!

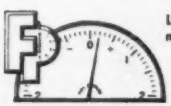
Our extensive experience in handling all kinds of dimensional gaging requirements—from the simplest Depth Gage to High-Speed Automatic Gaging and Sorting—is yours for the asking. The coupon below will get us together. Federal Products Corporation, Providence 1, Rhode Island.

One of thousands of Special Indicator Gages



Inspecting Wall Thickness Of Spinning Rings

Automatic Sorting — Straightness Of Golf Club Shafts



Largest manufacturer devoted exclusively to designing and manufacturing all types of Dimensional Indicating Gages

**FEDERAL**

**Federal Products Corporation**
**3312 Eddy Street, Providence 1, R. I.**

☐ I would like to discuss a gaging problem with you.
I am interested in the latest improved gage or gages below:

- ☐ Dimensional Dial Indicators
- ☐ Dimensional Dial Gages
- ☐ Dimensional Air Gages
- ☐ Multi-dimension Gages
- ☐ Continuous Measuring Gages
- ☐ Automatic Sorting Gages

Name.....
Company.....
Street.....
City.....
State.....


NEW MAINTENANCE TOOLS & SUPPLIES

*Begins on page 166*

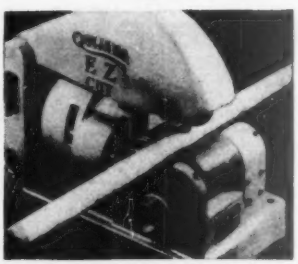
## For a Quick Floor-Patching Job

Clean and bond surface, dump in patch, tamp firmly, and use the repaired area immediately. Holds down repair time on concrete floors of all kinds—and saves you costly production delays.

Called Superset Tampatch, the material is smoothed by traffic and will bear extremely heavy loads. It's made of specially prepared aggregates coated with fast-drying synthetic resins combined with asphaltic oils.

**United Laboratories, Inc., 16801 Euclid Ave., Cleveland 12.**

■



## Portable Pipe Cutter

Power-driven rollers give you the fastest, cleanest pipe, tube, and conduit cutter of its type, makers claim. Handles pipe from ⅜ to 2 inches and tubing from ⅝ to 3 inches. A foot control switch leaves your operator's hands free to handle work, speed up cutting. Unit weighs 100 pounds.

**Quijada Tool Div., Gaines-Collins, 5474 Alhambra Ave., Los Angeles 32.**

*Turn the page*

Speed Nut Savings Stories

YALE & TOWNE LIFT TRUCK "PICKS-UP"

# Double Savings Payload

**...51% on the Cluster Instrument Panel Installation**

**...44% on Conduit Installation for the Motor Hoist**

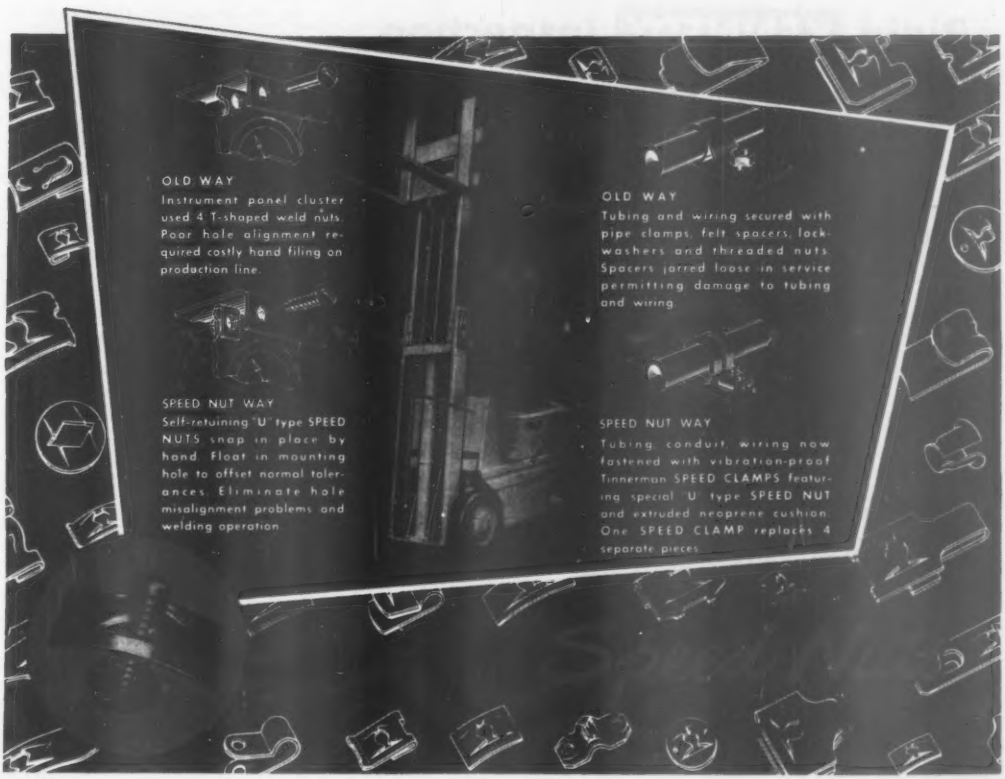
THE heavy-duty lifting and hauling performance expected of these Yale Industrial Lift Trucks means that they must be assembled with fasteners that can take it. That's why engineers at Yale & Towne Manufacturing Company, Philadelphia, Pa. chose SPEED NUTS and SPEED CLAMPS® over all other methods.

They found that Tinnerman self-retaining SPEED NUTS provide rugged, vibration-proof attachments, cut materials handling, and reduce assembly costs! The result in this case was an amazing "double savings payload" of 51%, and 44% in production costs, plus a whopping savings in materials!

Big production savings like these can be yours. A Tinnerman Fastening Analysis on your products may provide the answer... ask the Tinnerman representative in your area for full information on this important engineering service.

No matter what you assemble or build, it will pay you to turn to Tinnerman for better fastening engineering! Write today for your copy of the new "Savings Stories" booklet. TINNERMAN PRODUCTS, INC., Dept. 12, Box 6688, Cleveland 1, Ohio.

*In Canada:* Dominion Fasteners Ltd., Hamilton, Ontario. *In Great Britain:* Simmonds Aerocessories, Ltd., Treforest, Wales. *In France:* Aerocessoires Simmonds, S.A.—7 rue Henri Barbusse, Levallois (Seine.)


OLD WAY
Instrument panel cluster used 4 T-shaped weld nuts. Poor hole alignment required costly hand filing on production line.
SPEED NUT WAY
Self-retaining "U" type SPEED NUTS snap in place by hand. Float in mounting hole to offset normal tolerances. Eliminate hole misalignment problems and welding operation.
OLD WAY
Tubing and wiring secured with pipe clamps, felt spacers, lockwashers and threaded nuts. Spacers jarred loose in service permitting damage to tubing and wiring.
SPEED NUT WAY
Tubing, conduit, wiring now fastened with vibration-proof Tinnerman SPEED CLAMPS featuring special "U" type SPEED NUT and extruded neoprene cushion. One SPEED CLAMP replaces 4 separate pieces.

# Rigid KENNEDY Inspection Guarantees Fittings Free of Leaks, Burrs and Scales

**KENNEDY MALLEABLE-IRON** screwed fittings are made with tough, close-grained iron, tested to 43,000 psi. Carefully controlled annealing prevents splitting or cracking under almost any distortion forces. Uniform hot-dip galvanizing assures a heavy coating that will not chip or flake. Precision machining provides exact alignment . . . speeds installation time.

**KENNEDY CAST-IRON** screwed and flanged fittings, are made with tough, close-grained metal *more than* 50% *stronger* than ordinary gray iron. Precision threading and accurately machined flanges help you get strong, tight joints easily. The complete Kennedy line also includes cast-iron sprinkler and drainage fittings, and cast-iron flanges.

**KENNEDY BRONZE** fittings with tensile strength of 34,000 psi are individually tested to 100 lbs. air pressure under water to insure freedom from leaks. Available rough or polished in all standard types and sizes.

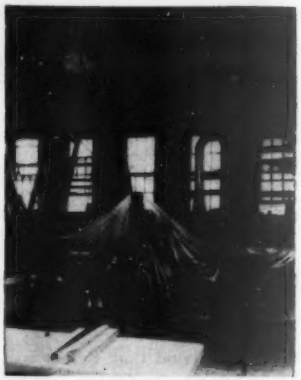
**WRITE FOR BULLETIN 104**

THE **KENNEDY**
VALVE MFG. CO. • ELMIRA, N.Y.
Est. 1879

VALVES • PIPE FITTINGS • FIRE HYDRANTS

NEW MAINTENANCE TOOLS & SUPPLIES

*Begins on page 166*



## Lightweight Tarpaulin

This tarp, made of polyethylene, should reduce the back-breaking tugging and lifting that tires out your maintenance crew. It tilts the scales at 1/10 the weight of fabric tarps of comparable size.

It is described as completely waterproof and mildew-proof; pliable in hot and cold weather; transparent, yet tough and tear-resistant. You can easily wash and dry it, and it will not absorb paints or liquids.

**Canton Containers, Inc., 1101 Ninth St., S. E., Canton 2, Ohio.**

■

## Balancer for Portable Tools

You can suspend portable tools weighing up to 5 pounds with the new Model 200-6-TB Benjamin Tool Balancer.

Keeps tool out of the way but always within easy reach.

And you can get a reel with automatic latching arrangement that enables your operator to fix cable at any desired length when it is pulled out of reel.

Galvanized aircord steel cable is 6 feet long and has tensile strength of 1000 pounds.

**Benjamin Reel Products, Inc., 10700 Broadway, Cleveland 25.**

*Turn the page*

**A Customer Reports:**

# 105" Asarcon 773 Bearing Bronze Cuts Short-End Scrap, Machining Waste

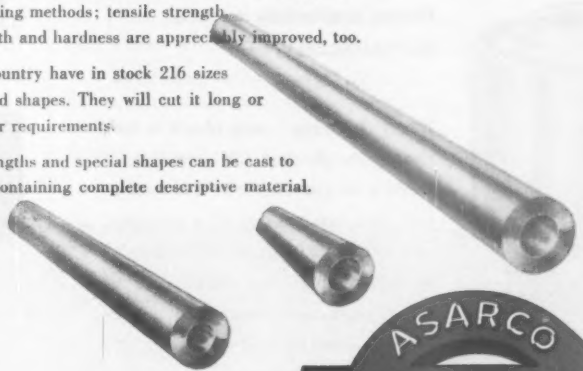
WILLYS-OVERLAND MOTORS has cut scrap loss in the making of machine tool bearings by using Asarcon 773 (SAE 660) Continuous-Cast Bronze. Pieces are cut to the exact length needed from 105" stock supplied by Meier Brass & Copper Company, Detroit (distributors); there is only one short end from an entire 105" tube, an economy impossible with ordinary 13" stock. Also, unique dimensional accuracy and uniformity reduce metal losses in finishing.

Asarcon 773 bearing bronze is continuous-cast in diameters ½" to 5⅛", cored or solid. It contains no hard or soft spots; no blowholes or porosity of any type. Since sand is not used in the process, and dirt and dross are excluded, there is no surface- or internally-trapped abrasive to dull tools or discourage high cutting speeds.

Fatigue characteristics are up to 100% higher than those of the same alloys produced by other casting methods; tensile strength, yield strength and hardness are appreciably improved, too.

Distributors across the country have in stock 216 sizes of Asarcon 773 rods, tubes and shapes. They will cut it long or short to suit your requirements.

A variety of alloys, longer lengths and special shapes can be cast to order. Write for free catalog containing complete descriptive material.



ASARCO CONTINUOUS-CAST RODS TUBES SHAPES ®

West Coast Sales Agent:
KINGWELL BROS. LTD., 444 Natoma Street, San Francisco, Calif.

**American Smelting and Refining Company**

OFFICES: Perth Amboy Plant, Barber, New Jersey
Whiting, Indiana

**SUPREME**
**BRAND CHUCKS**

**CHECKED FOR ACCURACY!**

**no guesswork . . . precision manufacturing and finest materials assure DEPENDABILITY!**

Sold Through Distributors

Every Supreme brand chuck is mechanically checked for accuracy . . . there is no guesswork in this inspection that assures you of a precision product. It is just part of the careful manufacturing that enables us to present this new Supreme chuck as both dependable and accurate. The best way to appreciate it is to try it . . . ask for Supreme brand chucks the next time you order.

**SUPREME BRAND CHUCKS**

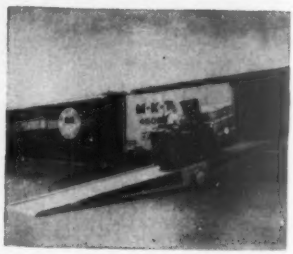
Supreme Products, Inc., 2222 South Calumet Avenue, Chicago, Illinois

THE CHUCK THAT LIVES UP TO ITS NAME...SUPREME




*Begins on page 152*

# MATERIALS HANDLING



## Portable Yard Ramp

No dock facilities? How about this magnesium ramp for loading and unloading your freight cars? Also makes a good time-saver when existing facilities are crowded.

You can get ramp in five sizes, all 30 feet long and varying in width from 60 to 70 inches. Handles 6000- to 16,000-lb. loads.

**Magnesium Co. of America, 1515 N. Kilpatrick Ave., Chicago 51.**

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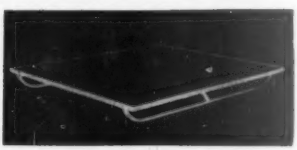
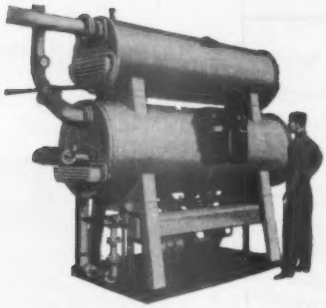


## Tubular Steel Pallet

This all-purpose, 8-entry pallet is lighter than wooden pallets and is priced to compete with them. Rugged tubular skid runners are welded and braced to a rectangular angle-iron frame that encases and protects tough laminated wood deck. Described as having 10 times the serviceable life of wood pallets.

**Econoweld Co., 1805 Webster St., Dayton, Ohio.**

*Turn the page*



# Looking for a lightweight with a heavyweight punch?

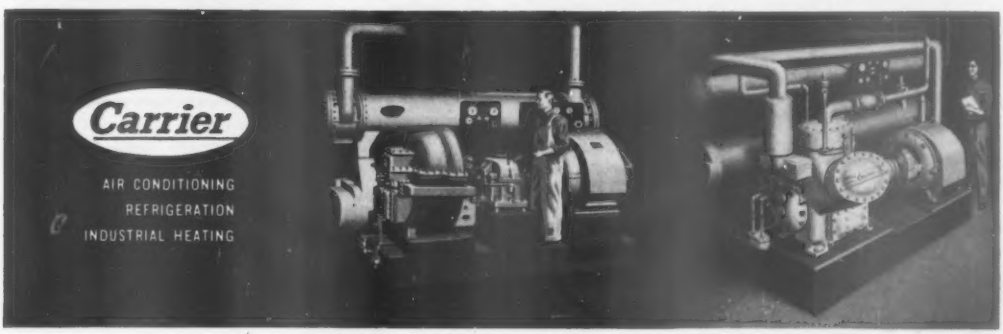
Then look at the Carrier Absorption Refrigerating Machine. Lightweight enough to be installed on roofs or intermediate floors without heavy foundations, it has the capacity to do a heavyweight job. Comes in five sizes, from 115 to 350 tons, adaptable for multi-unit installations.

This Carrier machine cools with steam by absorption. High pressure or low pressure steam. Waste steam from other plant equipment. Steam from a boiler that operates at reduced capacity during the summer months. It uses steam at a rate of less than 20 lbs. per hour per ton of refrigeration.

With no major moving parts, it needs no highly skilled operator. Its refrigerant is the cheapest anyone ever heard of — water. And its absorbent is a simple salt — won't burn or explode.

It handles partial loads automatically and operates at high efficiency from full load down to 10% of capacity.

You can see the advantages. Maybe they fit your needs. If you'd like to know more, check the nearest Carrier office. Or write for our booklet, "Absorption Refrigerating Machines." Carrier Corporation, Syracuse, New York.




The Centrifugal Refrigerating Machine (left) and the packaged Reciprocating Refrigerating Machine (right) also provide cooling for industrial processes or comfort air conditioning and both offer unique advantages. Like all Carrier equipment, they carry with them Carrier's experienced service—quick and dependable. Always, Carrier is your best investment.

# What Is "Communication by Telescriber"?

**(Reading time — 80 seconds)**

**WHAT Is A Telescriber?**

A telescriber is a communication instrument which instantly transmits messages in the sender's own handwriting, from one point to one or more remotely located stations.

**WHERE Are Telescriber Systems Used?**

In any organization (regardless of size) where there is a need for instant, frequent, accurate written contact between departments or buildings.

**ARE ALL Messages Received At Each Remote Station?**

Selector keys permit complete system flexibility. Messages are received only by those stations chosen by the writer. All messages and signatures are in the same handwriting as the original.

**CAN BUSINESS Forms Be Used In The Telescriber?**

Yes. The TelAutograph 'Instan-Form' telescriber is available where *instant* communication on business *forms* is desired.

**WHAT ARE Some Accepted Uses of TelAutograph Telescribers?**

Production and Quality Control • Material Handling • Sales Order • Maintenance Control • Dispatching • Central Files • Work-In-Process, etc.

**CAN I Determine Whether A Telescriber System Would Improve Our Operation?**

A "Communications Guide" is available without cost to aid you in analyzing your different communication problems.

**CAN WE Get Further Assistance Without Becoming Obligated?**

Yes. It is standard TelAutograph Corporation policy to have its field staff aid in making analyses and offering recommendations. *This is done without pressure or obligation.*

**HOW CAN We Obtain The "Communications Guide" And Other Information?**

Send your request to Department B-212 at the address below. It will be honored promptly.

**TelAutograph** CORPORATION

**16 West 61st Street • New York 23, N. Y.**

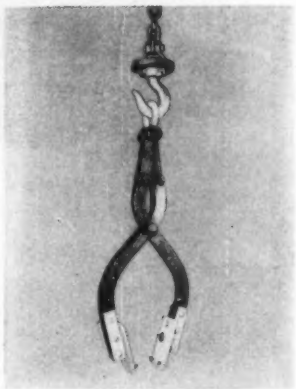
Telescriber Service TelAutograph *

Instan-Form *

*Trade Mark


MATERIALS HANDLING EQUIPMENT

*Begins on page 174*



## Link Grapple With Teeth

The heavier the load, the tighter the hardened steel points grab. Gives you safer handling of cases, kegs, barrels, and steel drums.

Opening ranges from 1½ to 24 inches, and capacity is 2000 pounds.

You can order Special grapples for heavier jobs.

**Eastern Brass & Copper Co., Inc., 122 E. 180th St., N. Y. 60.**

■

## Magnetic Lifter for Stock and Parts

Helps your employees feed steel into presses, separate stacked sheets, remove slugs from dies, etc. You add magnets according to load to be lifted.

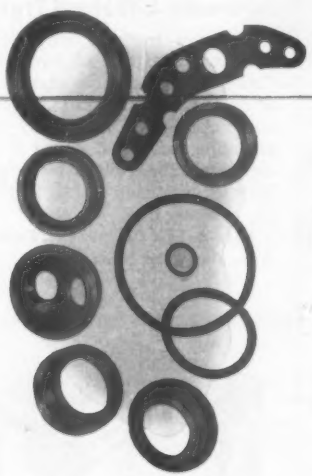
Self-aligning magnetic blocks overcome irregular surfaces, bumps of dirt and metal chips. And a twist of the wrist releases whatever your operator is lifting.

**Multifinish Mfg. Co., 2114 Monroe Ave., Detroit 7.**

*Turn the page*

*Meet William L. Harris*
*Superintendent*
*International Packings Corporation*
*Affiliated with Graton & Knight Company*

Graduating with a B.S. Degree in Chemistry from Hamline University in St. Paul, Mr. Harris has devoted his entire career in the two fields of synthetic rubbers and leathers. As a scientist, the government called upon him as a technical adviser to supervise the GRS rubber program. As a production man, he has served as foreman, production manager, and ultimately as development manager for new and experimental work on mechanical packings and specialties. This background has ideally fitted him for his present job as Superintendent. He knows his materials and what each can do. Equally important he knows how to make these materials into efficient packings.



*In this current series of advertisements we want you to meet these men. Their experience is yours to command.*

## There's practical know-how in the manufacture of packings

The type of packings, the material from which they are made, the treatment given that material are important. At G&K-INTERNATIONAL you'll find a wealth of experience on which to base a wise choice.

Equally important is how these packings are made — the step-by-step adherence to tolerances, both dimensional and physical; the proper sequence given to operations and treatments so as to obtain to the fullest those qualities that mean longer life and more efficient service; and, of course, modern machinery, skilled workmen and intelligent supervision all combined to produce those packings most economically. These production advantages are all yours when you specify G&K-INTERNATIONAL packings.

Let us show you how *your* packings may be made to give *you* longer life and more efficient service. Call in our engineer, give him all the facts about your installation, and our recommendation will follow promptly.

second century G and K — INTERNATIONAL
Leather and synthetic packings

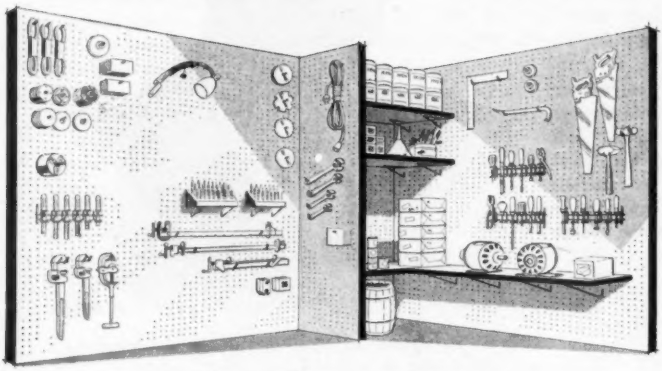
GRATON & KNIGHT COMPANY
Worcester 4, Mass.

INTERNATIONAL PACKINGS CORPORATION
Bristol, New Hampshire

new efficiency with . . .

PEG-BOARD

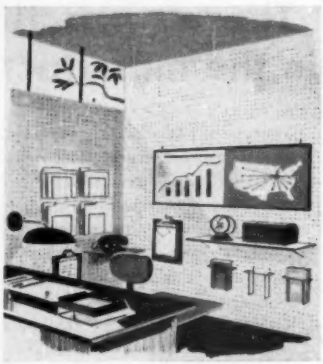
WORKING WALLS



FOR A "FLEXIBLE" TOOL ROOM
OR A MODERN OFFICE

PEG-BOARD is a combination of perforated hardboard matched with over 60 hanging fixtures . . . file folder racks, shelf brackets, hooks, magazine racks, etc. . . . all instantly interchangeable without screws, nails or tools of any kind.

PEG-BOARD adds space and efficiency because it takes objects off the floor or desks and arranges them neatly on the wall. PEG-BOARD panels are available in several sizes—take paint wonderfully. Be sure to include PEG-BOARD in your plant modernization plans.



*for complete information and prices*
**WRITE YOUR NEAREST DISTRIBUTOR**

**NEW YORK** • PEG-BOARD OF NEW YORK
131 E. 64th St., New York 21, N. Y.

**CLEVELAND** • DAVIS PLYWOOD CORP.
12555 Berea Rd., Cleveland 11, Ohio

**MIAMI** • A. H. RAMSEY & SONS, INC.
71 N.W. 11th Terrace, Miami, Fla.

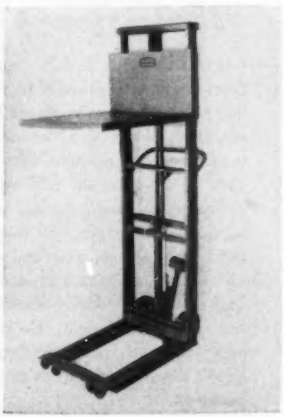
**LOS ANGELES** • PEG-BOARD OF CALIF.
717 E. Gage Ave., Los Angeles 1, Cal.

**MINNEAPOLIS** • L. E. HIER EQUIP. CO.
23 North Sixth St., Minneapolis, Minn.

Manufactured by
**B. B. BUTLER MFG. CO., INC.** 3151 Randolph St., Bellwood, Illinois


MATERIALS HANDLING EQUIPMENT

*Begins on page 174*

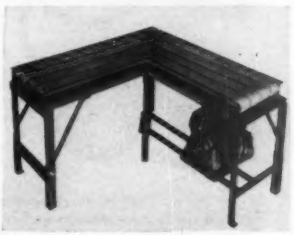


## Hydraulic-Lift Hand Truck

You can lift and move ¼-ton loads with this combination. Comes equipped with platforms or forks designed to fit your special needs. You raise load by actuating foot pedal, lower it at controlled speed with hand release lever. Models available with 36- or 58-in. lifts.

**Port-A-Lift Co., 2998 N. Euclid Ave., Bay City, Mich.**

■

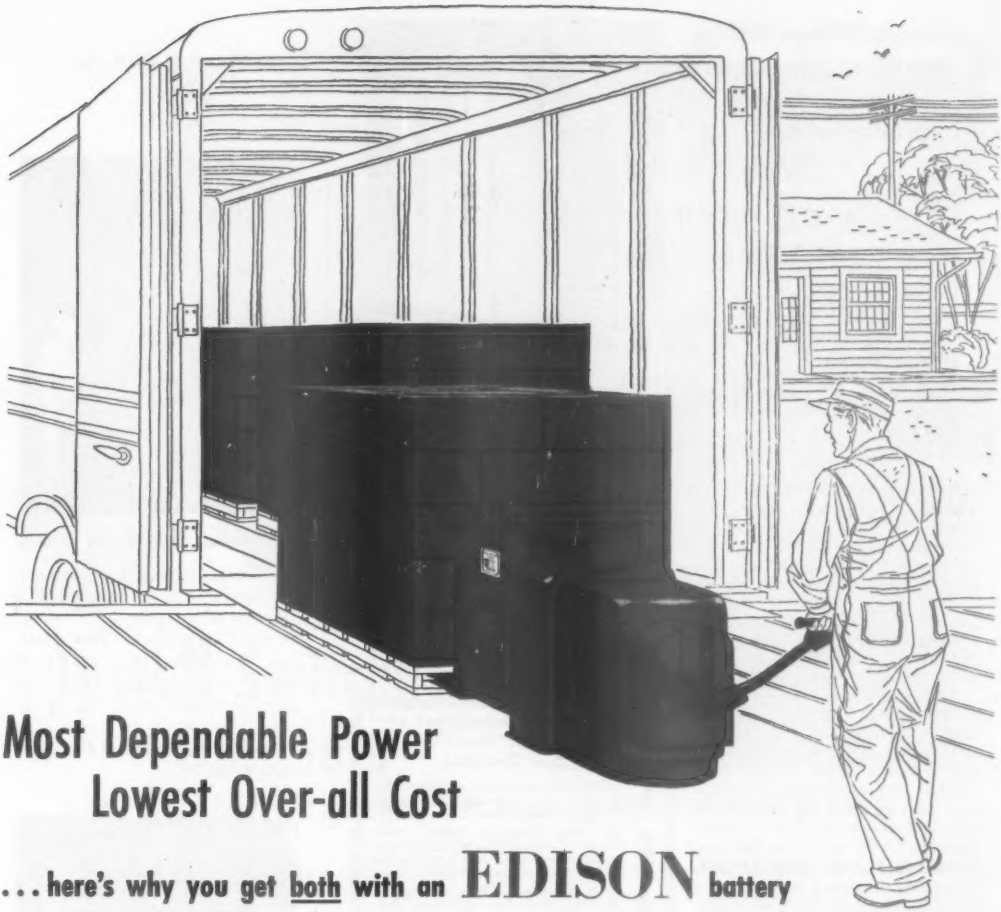


## For a Quick Turn

This 90-deg. power-driven curve carries any package that can be moved on a gravity roller conveyor. And it eliminates slowups, jamming, and stoppages by maintaining even flow. Available in widths from 10 to 30 inches in 2-in. increments.

**Henry J. Ferguson Co., 143 West Ave., Jenkintown, Pa.**

*Turn the page*



# Most Dependable Power Lowest Over-all Cost

## . . . here's why you get <u>both</u> with an EDISON battery

**the strength of steel**—With its *steel* positive plate, *steel* negative plate, *steel* cell container an EDISON can take the toughest abuse. Many have fallen off loading docks and yet gone right back into service.

**electrically foolproof**—Accidental shorting, over-charging, reverse-charging won't hurt an EDISON. It does not require critical regulation of rate or length of charge. Motor generators, rectifiers or d-c shop lines are all satisfactory sources of charging power.

**faster charging**—Only six to seven hours are required for completely recharging an EDISON. Thus you can easily recharge three EDISON batteries from one circuit in one 24-hour period.

**more than double the life**—Many users report EDISONS give 2 to 3 times longer life than other types of batteries.

**lower depreciation**—That longer EDISON life—2 to 3 times—has a dollar and cents value. For instance, depreciation charges are less each year. In addition to the fact that it is the most dependable battery you can buy, it has the lowest ultimate cost because of longer life, less maintenance, less downtime. Ask for Bulletins SB 2039 and SB 3808. Your Edison field engineer will show you how you can save money with an EDISON.

EDISON

*Nickel • Iron • Alkaline*

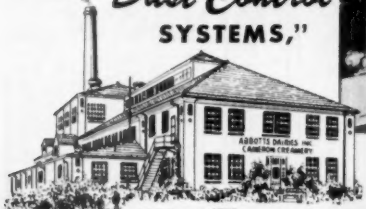
STORAGE BATTERIES

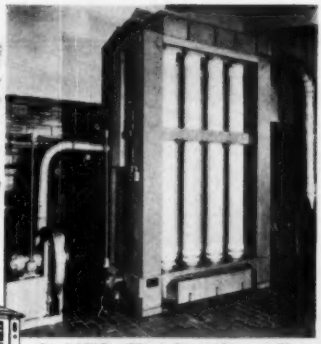
Edison Storage Battery Division of
Thomas A. Edison Incorporated, West Orange, N. J.

***Most Dependable Power—Lowest Over-all Cost***

***. . . you get <u>both</u> with an* EDISON**

"We have completely eliminated loss of product with our **DAY** *Dust Control* **SYSTEMS,"**





Day "AC" Dust Filter in Abbotts Cameron, Wis. plant, serves bag filling machinery and scale hopper. Note the immaculate condition around filter, also the off-the-floor installation which permits flushing of the floor underneath the filter.

——— says

*E. C. Schultz, Cameron, Wis., General Manager, Western Division, Abbotts Dairies, Inc., Philadelphia.*

**MATERIAL RECOVERED WILL PAY FOR FILTERS IN TWO TO THREE YEARS:** "Late in 1951 we installed a DAY Dust Control System with a DAY "AC" Dust Filter at our Bruce, Wis., plant for use in connection with the packaging of dried milk solids. The installation proved so successful that a similar installation was made at our Cameron, Wis. plant early in 1952," reports Mr. Schultz.

"The product now recovered which formerly was a complete loss will pay for the cost of the systems in two to three years," he continues.

"Equally important is the amount of time saved in plant maintenance. We no longer have the dust from the filling operation settling on floors, walls and equipment. Clean-up operations are much easier.

"Our operators also are exceedingly pleased with the systems. They no longer have to contend with dust in the air they breathe, nor contend with it in their clothes. Our entire organization is well pleased with the results obtained from our Day Dust Control Systems," concludes Mr. Schultz.

**IMPROVE PLANT CLEANLINESS:** If you're operating a dried milk plant, food plant, chemical plant, mill or any other industry where dust is created and where valuable product is being lost, you owe it to yourself and your company to investigate the Day "AC" Dust Filter. With this filter, you too, can enjoy better plant cleanliness and sanitation at lower maintenance costs, and the tremendous savings possible through the recovery of valuable materials.

***Check these 8 advantages of the* DAY *"AC" Dust Filter in Your Operation***

1. **Continuous-automatic operation** by reverse jet air cleaning eliminates cleaning shutdowns.
2. **No Dust Catching Ledges** with square-to-round fittings; no flat surfaces where dust can accumulate and become contaminated.
3. **High Cleaning Efficiency** up to 99.998% recorded by actual test; valuable product saved.
4. **High air-to-cloth ratios** of 10, 15 and 20 to 1 are maintained with uniform back pressure.
5. **Constant air volume** with back pressure rising slightly only when first started, then leveling off and remaining constant.
6. **Parallel air flow** allows dust and air to travel downward together assisting the discharge of dust.
7. **More Economy** in space, installation and maintenance costs. Less filter is required because of continuous cleaning operation.
8. **Application Adaptability** with units furnished in multiples of 4 tubes, housed or unhoused, can be applied for either pressure or vacuum.

***Write to-DAY for* FREE *New Dust Filter Bulletin No. 528 and Dust Problem Analysis Sheet for dust checking your plant.***

**A SINGLE UNIT OR A COMPLETE SYSTEM**

**The DAY Company**

SINCE 1881

858 3rd Ave. N.E., Minneapolis 13, Minn.
IN CANADA: P. O. Box 70R, Ft. William, Ontario
Branch Plants in Ft. Worth, Buffalo and Welland, Ontario

MATERIALS HANDLING EQUIPMENT

*Begins on page 174*

## Aluminum Handling Box

It weighs in at 250 pounds and will handle a 5000-lb. load. The runners allow plenty of leeway for your fork trucks. Box measures 60x42x36 inches and is of welded construction, using 61S aluminum alloy sheet and extrusions.

**Powell Pressed Steel Co., Hubbard, Ohio.**

■

## Multiple Strapper

This unit moderately compresses package and applies up to three steel straps at the same time at 15-in. intervals. It can handle cases up to 50 inches wide, 53 inches high.

And you can install it in a 5x7-ft. floor space with overhead clearance of 8½ feet. Has 110-volt, 60-cycle circuit control and uses 50 psi. of compressed air.

**Acme Steel Co., 2840 Arch Ave., Chicago 8.**

*Turn the page*

# Install Switchgear Outdoors

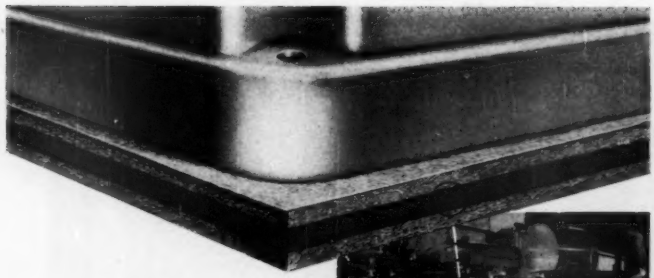
## GET CONVENIENT OPERATION PLUS COMPLETE PROTECTION

When building-cost considerations suggest outdoor switchgear installations, you'll naturally want equipment that can be most conveniently operated and maintained in the open . . . and weatherproofed to protect against rust and corrosion. Westinghouse Outdoor Metal-Clad Switchgear meets these specifications.

***Convenient Operation and Maintenance*** — Easily operated horizontal drawout circuit breakers eliminate lifting and lowering. A few turns of a crank connect or disconnect the breaker. Breakers of like rating are interchangeable and are easily rolled on the adjustable-height transport truck with its combination latching device for breaker and stationary structure.

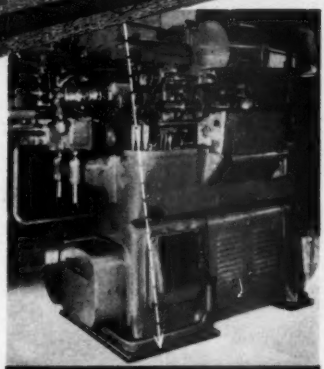
***Weatherproof Construction***—Utilizing rigid, self-supporting, jig-welded construction features, Westinghouse Outdoor Metal-Clad Switchgear is equipped with a weatherproof housing, special underframe or base, and access doors at both front and rear of the unit. Space heaters and special ventilators in each unit reduce the possibility of condensation. As long-term protection against rust and corrosive elements, the metal frame is Bonderized, primed and finish painted, and the base receives a heavy spray application of all-weather undersurface coating.

For complete facts on outdoor or indoor metal-clad switchgear, write for Booklet 5306. Address: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60793



# Reduce VIBRATION Eliminate FLOOR DRILLING

by mounting your machinery on



Brown & Sharpe Model 00-G Screw Machine mounted on UNISORB at Telechron, Inc., Worcester, Mass.

# UNISORB®

Old-fashioned bolt-and-lag-screw methods of machine mounting . . . costly, inefficient . . . are *gone for good* when you mount machinery on UNISORB.

What's more, by eliminating 60-85% of transmitted vibration and noise, UNISORB prolongs life of machinery, building and floors . . . improves worker morale and efficiency . . . often permits higher machine speeds and increased production.

We supply a special cement that securely bonds UNISORB pads to machine feet and floor with a holding strength of at least 90 lbs. per square inch.

***UNISORB is also available pre-coated with adhesive, but is not recommended for use with machines that require shimming.***

*You Reduce* VIBRATION NOISE MAINTENANCE

**with UNISORB Mountings**

- no bolts, no lag screws, no holes to be drilled, no floor damage
- Felters adhesive holds for keeps, yet permits re-positioning of machines. (Our UNISORB Booklet tells you how.)

## THE FELTERS COMPANY

210-A SOUTH STREET, BOSTON 11, MASS.

*Offices:* New York, Philadelphia, Chicago, Detroit, St. Louis
*Sales Representative:* San Francisco
*Mills:* Johnson City, New York; Millbury, Mass.; Jackson, Mich.

REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

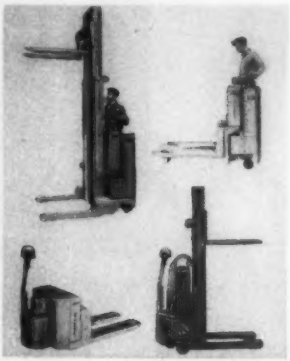
MAIL COUPON FOR FREE BOOKLET TODAY!

Please send my free copy of the booklet containing the complete story of UNISORB Mounting.

NAME ..... TITLE .....
(Please Print)
COMPANY .....
STREET .....
CITY ..... ZONE ..... STATE .....


MATERIALS HANDLING EQUIPMENT

*Begins on page 174*

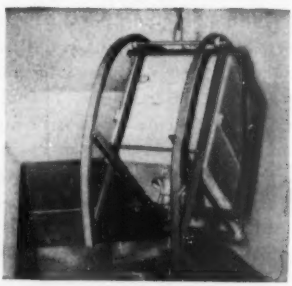


## For Narrow Aisles

Lewis-Shepard attacks your storage space problems with this line-up of electric materials handling trucks that can operate in 6-ft. aisles with 48-in. loads. The riding types carry up to 4000 pounds at 4 mph., stack 10½ feet high. Walkies handle loads up to 6000 pounds.

**Lewis-Shepard Products, Inc., Watertown, Mass.**

■



## Carboy Rocker

You can hang this rocker over vat to get the last drop safely and efficiently. Simple leverage will right rocker on floor. And wheels enable you to move carboy where you need it. Adjustable steel rods connect angle steel braces and keep tight grip on carboy.

**Morse Mfg. Co., Syracuse, N. Y.**

*Turn the page*

GREASEPROOF **AZPHLEX** FLOORS SERVE BEST!

**BEST IN GREASE RESISTANCE** because Azphlex has remarkable resistance to food fats and oils — spilled foods won't spoil Azphlex floors.

**BEST IN COLOR CHOICE** because Azphlex comes in a group of new and unique colors, giving you a choice of 12 brilliant, clear, strikingly modern colors not commonly found in any similarly priced flooring product.

**BEST IN LONG SERVICE** because Azphlex has through-the-thickness marbleizing and a smooth dense surface that give exceptional resistance to wear — you get lasting service and beauty with Azphlex floors.

**BEST IN EASY KEEPING QUALITIES** because Azphlex has a smooth, tight surface that will not allow dirt or grime to wear in or grease to penetrate — you get genuine economy of maintenance with Azphlex floors.

**BEST IN QUALITY AT LOW PRICE** because Azphlex is a premium quality tile in premium colors, yet it costs no more than other products in the same price class.

*See your nearest Asrock flooring contractor for samples of Azphlex or write us for color chart and samples.*

AZROCK FLOORING PRODUCTS

**UVALDE ROCK ASPHALT COMPANY**

Frost Bank Building • San Antonio, Texas

*Makers of* AZROCK AZPHLEX VINA-LUX DURACO

*Asrock Floor Products Serve Industry*

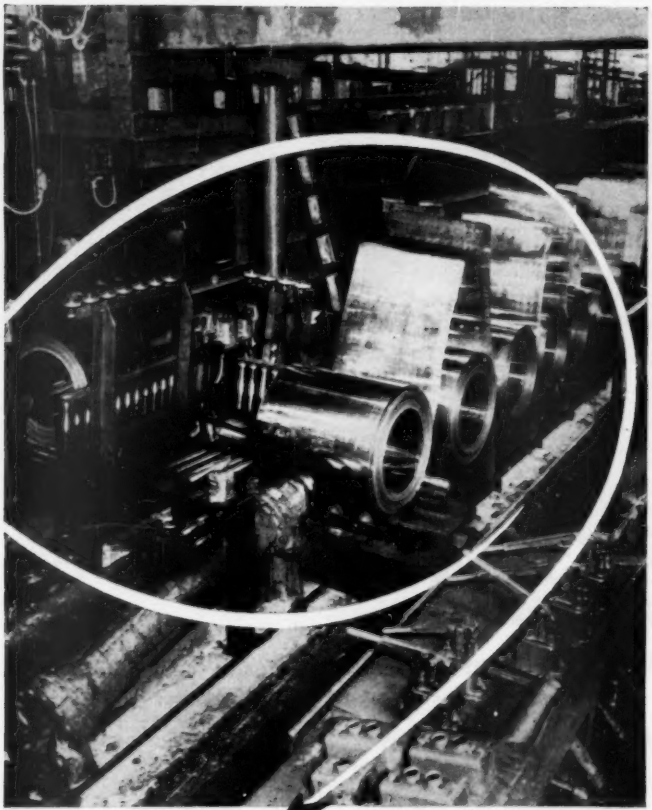


Photo courtesy Chase Brass and Copper Co.

## WHAT IS "Continuous Flow" CONVEYING?

WE HEAR A LOT these days about **Continuous Flow** in materials handling. Years ago, when the first large, spectacular conveying systems were being developed, the words **Continuous Flow** were used to describe the extensive Mathews' systems of that type. They did not correctly apply then, nor do they now, to installations involving a few sections of roller or wheel conveyer, or a simple belt conveyer applied here and there. The term best applies to the jobs involving complete systems of conveying machinery which result in a smooth, mechanized flow of materials through receiving, processing, storage and shipping.

These broad engineering facilities and the necessary wide range of conveying equipment, have been the Mathews stock-in-trade for nearly 50 years. *Write for Catalog 852 today for examples of* ***Continuous Flow*** *conveying.*

**MATHEWS CONVEYERS**

**GENERAL OFFICES** . . . . . *Mathews Conveyer Company*
ELLWOOD CITY, PENNSYLVANIA

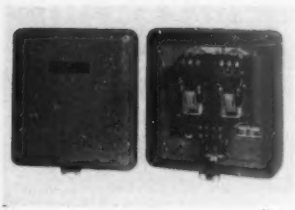
**PACIFIC COAST DIVISION** . . *Mathews Conveyer Company West Coast*
SAN CARLOS, CALIFORNIA

**CANADIAN DIVISION** . . . . . *Mathews Conveyer Company, Ltd.*
PORT HOPE, ONTARIO

*Engineering Offices or Sales Agencies in Principal American and Canadian Cities*



# MEASURING & CONTROL

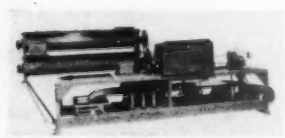


## Automatic Throwover Panel

Transfers electric circuits to emergency power source when normal source fails — and back again when regular service is resumed. Also controls standby power equipment, turning it on and off at appropriate times. Standard line in sizes 1 to 3 employs vertical-lift contactors. Sizes 4 to 6 use clapper-type.

**General Electric Co., Schnectady 5, N. Y.**

■



## Continuous Feed Regulating Weigher

The new Transportoweigher operates at pre-set capacities of 10 to 24 short tons per hour.

Integrator records on a direct-reading totalizer tonnage passing over belt. Indicator, calibrated 0 to 100% of capacity, shows instantaneous weighing rate. It can be calibrated in tons per hour, pounds per minute, or any desired special scale reading.

**Sintering Machinery Corp., 301 Sinter Ave., Netcong, N. J.**

*Turn the page*

# SAFE FOR 125 LB. STEAM

*New Composition Disc Valves*

**125 Pounds W.S.P.—200 Pounds W.O.G.**
**1/4 to 2 Inches in Size**
**Globes, Angles, Checks**

Why buy more valve than you need? Why spend extra dollars putting 150-pound valves on service lines carrying 125 pounds of steam pressure—or less? O-B's *new* No. 16 Line valves will handle 125 pounds of working steam safely and economically. Cast of high-grade steam bronze, these new solder-type valves can be repacked under full pressure and feature hard rubber replaceable discs plus a free-swivelling, self-levelling disc holder.

On your next tubing job specify O-B No. 16 Line Valves. Or if you are using pipe, ask for O-B No. 15 Line—same valve but with threaded ends.

BRONZE GLOBES, ANGLES, GATES AND CHECKS
FOR INDUSTRIAL SERVICE

*Ohio Brass*

MANSFIELD • OHIO

4191-V

O·B VALVES

## your key to '53...

# YOU SHOULD BE HERE

## ...to see and learn about the latest developments in

# HEATING • VENTILATING AIR CONDITIONING

At Chicago's International Amphitheatre, from Jan. 26-30, you'll SEE *all* that's new, LEARN the latest trends and practices, GET a wealth of new ideas, and MAKE a host of valuable contacts during the 11th International Heating and Ventilating Exposition.

Over 300 technically-staffed exhibits will provide an exceptional opportunity for plant owners, managers, operators, architects, and engineers to get a first-hand look at the latest products for conditioning air in all types of buildings, plants, and homes . . . compare hundreds of new, improved items, large and small . . . find cost-saving solutions to problems by discussing them with engineering specialists . . . get MONTHS AHEAD in FIVE DAYS.

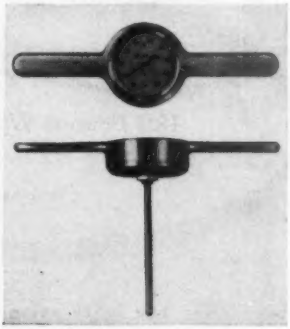
Arrange now to ATTEND and BENEFIT from this exposition of ideas and progress; the largest of its kind ever held.

INTERNATIONAL AMPHITHEATRE
**CHICAGO**
**JAN. 26-30**

*11th* Air Conditioning Exposition
INTERNATIONAL HEATING & VENTILATING EXPOSITION
Under Auspices of American Society of Heating & Ventilating Engineers
MANAGEMENT INTERNATIONAL EXPOSITION CO.


MEASURING & CONTROL EQUIPMENT

*Begins on page 184*



### Thermometer With Handle

Your operator can dip it into foundry sand, chemical mixtures, ets., without getting burned.

Made of stainless steel with cast aluminum handles. Available in all regular scales in either Fahrenheit or Centigrade. And you can get special ranges to order.

**W. C. Dillon & Co., Inc., 1421 S. Circle Ave., Forest Park, Ill.**

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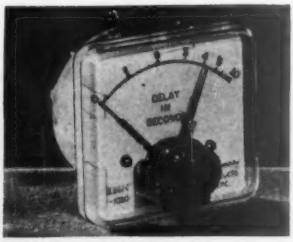



### Time-Delay Relay

Gives you adjustable time delays for many ranges of voltage and current, both a-c and d-c. Retards action of coil in magnetic field for delays up to 10 seconds.

This relay can be designed to operate on a few microamperes or hundreds of amperes. And it can also be supplied for any range of volts from 5 millivolts up.

**Assembly Products, Inc., Main & Bell Sts., Chagrin Falls, Ohio.**

*Turn the page*

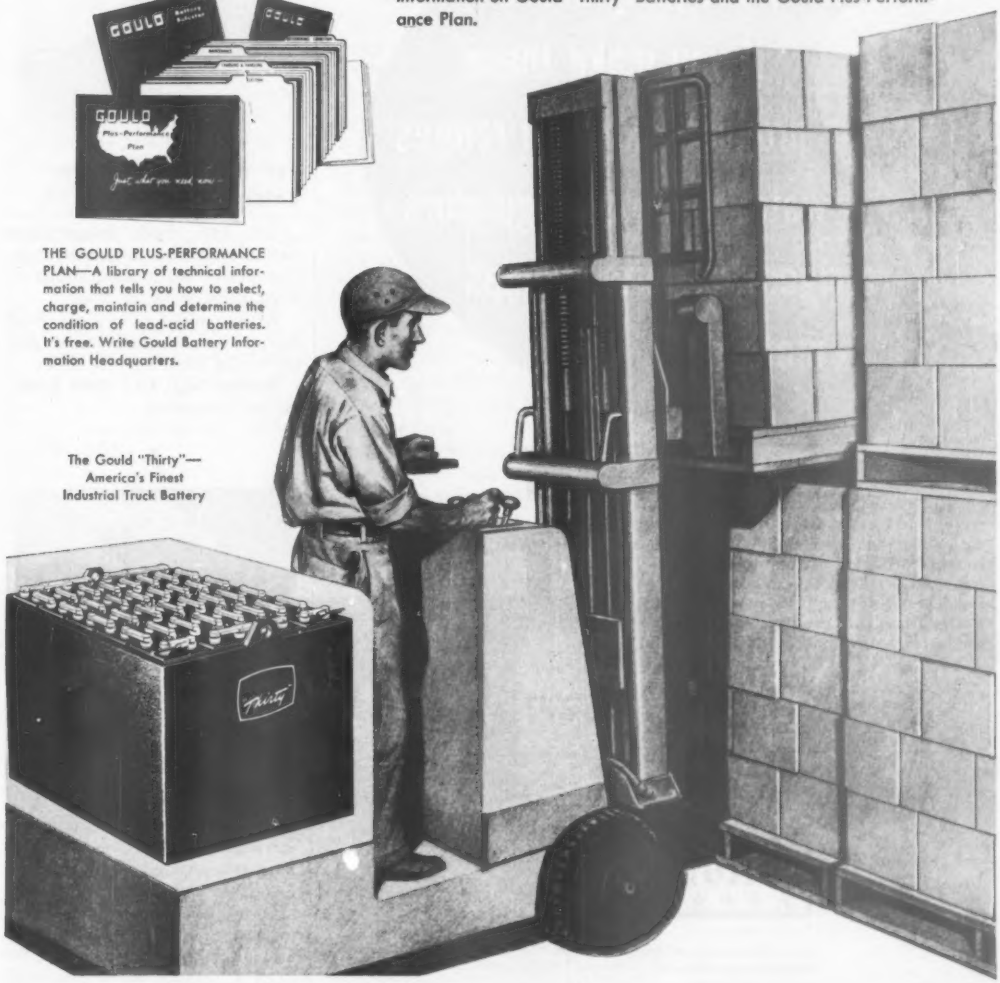
# HERE'S HOW TO BEAT THE HIGH COST OF MOVING MATERIALS!

**For maximum materials handling economy, standardize on Gould "Thirty" Batteries for your electric industrial trucks . . . and systemize battery maintenance with the Gould Plus-Performance Plan described at the left. Here's a sure-fire, cost-cutting combination. Write for full information on Gould "Thirty" Batteries and the Gould Plus-Performance Plan.**




THE GOULD PLUS-PERFORMANCE PLAN—A library of technical information that tells you how to select, charge, maintain and determine the condition of lead-acid batteries. It's free. Write Gould Battery Information Headquarters.

The Gould "Thirty"—
America's Finest
Industrial Truck Battery



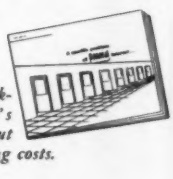

**GOULD** *Industrial Batteries*

**GOULD-NATIONAL BATTERIES, INC.,** TRENTON 7, N. J.

*Always Use Gould-National Automobile and Truck Batteries*

your competition may be MORE than one jump ahead if you make these products: kitchen ranges • water heaters • regulators • refrigerator units • pumps • motors

Our packaging engineers have just designed new and different containers for *each* of these products. They are lightweight and extra strong! They are *designed* to cut packing and shipping costs, to speed production! They are good looking, too! We have experience in designing better shipping containers for practically all types of products. Write us. Get the facts on this important subject.



*Get this important booklet. Write today! It's free! It shows how to cut packing and shipping costs.*

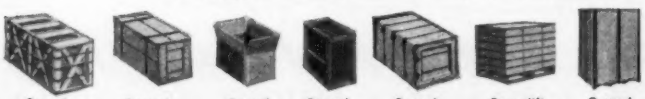
ALL TYPES OF ENGINEERED SHIPPING CONTAINERS

**General** ★★★★★ **BOX COMPANY**

1807 **Miner Street,**
**Des Plaines, Ill.**

*District Offices and Plants:*

**Cincinnati, Denville, N. J., Detroit, East St. Louis, Kansas City, Louisville, Milwaukee, Sheboygan, Winchendon, General Box Company of Mississippi, Meridian, Miss., Continental Box Company, Inc., Houston, Dallas**



General Wirebound Crate | General Nailed Box | General Corrugated Box | General Cleated Corrugated Container | General All-Bound Box | Generalift Pallet and Pallet Box | General Watkins-Type Box


MEASURING & CONTROL EQUIPMENT

*Begins on page 184*

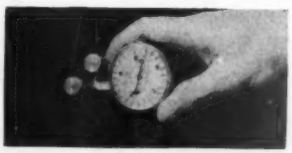
## For the Temperature-Tolerance Problem

You can check temperature variables in close tolerance measurement by just placing probe on gage block, work, or both.

Within minutes, you can read temperature on instrument dial calibrated from 60F. to 100F.

**Webber Gage Co., 12900 Triskett St., Cleveland.**

■



## Hysteresis Brake With Magnetic Drag

Alnico magnets, instead of friction, hold constant tension on yarn, rubber, glass fiber, and small wire.

Restraining force on pulley is constant at all speeds, and you can adjust it by turning calibrated head mounted above pulley.

Magnets assure you minimum abrasion since material is always in contact with revolving pulley and not rubbed or drawn over the surface. Handles up to 700 yards per minute with tension of 315 to 10.5 grams.

**General Eeletric Co., Schenectady 5, N. Y.**

*Turn the page*

LINDE'S News of Metalworking

## New Machine Carriage Saves Time On Many Jobs

A new machine carriage in the low-priced field does dozens of metalworking jobs—and does them more quickly, accurately, and uniformly than the most skilled hands. This machine, the OXWELD CM-45, handles practically all machine carriage requirements in small metalworking shops, and supplements heavier equipment in larger plants, shipyards, and mills.

Used on track, the CM-45 is ideal for accurate straight-line cutting. It also cuts top or bottom bevels at practically any angle. With standard radius rods, it cuts circles with diameters of from 2 to 54 inches. To cut larger circles, a longer radius rod can easily be substituted.

Flame-treating work—be it flame-hardening, flame-softening, or low-temperature stress relieving—requires precisely controlled heat. With the CM-45 and appropriate heating apparatus, you get just that; thus you can be sure that each of your flame-treating jobs will be done uniformly.

These are only a few of the jobs that the OXWELD CM-45 Machine Carriage will do for you. Many additional cutting, welding, and heating applications will be suggested by the requirements of your own shop.

The CM-45 saves you time, not only because it does each job efficiently, but also because it is so easy to set up and operate. There is no complicated machinery to master. Its simple design makes it easy to adjust or repair. All parts are readily accessible.

Operating controls consist of a speed-control dial that can be preset or adjusted at any time, and a two-position clutch lever. All controls are grouped together at the rear of the machine for your convenience.

Since the machine weighs only 33¾ lb. complete with cutting blowpipe (as shown in Fig. 1), it's an easy, one man job to move it from one section of your shop to another. The machine's compactness also makes it convenient for use in close quarters where larger machines cannot be used.

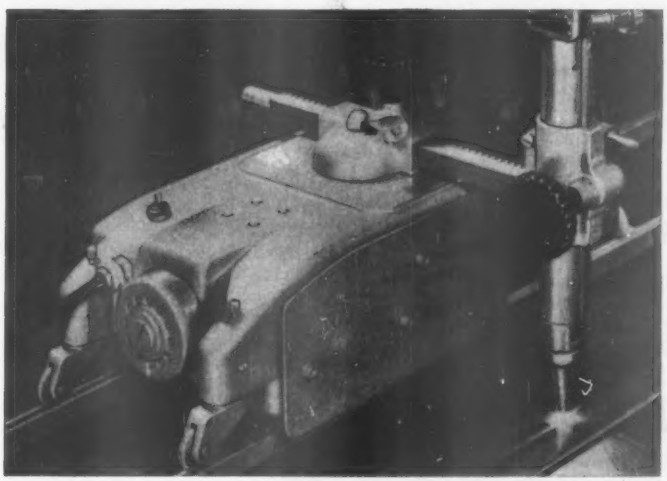


*Fig. 1—Cut straight lines or bevels in plate or other steel forms. For all the CM-45's many jobs, a stepless speed range of 4 to 32 in. per min. is available.*

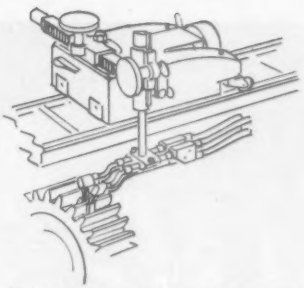


*Fig. 2—Flame-treating work requires precise control of applied heat. The CM-45, with suitable apparatus, assures you of efficiency and uniformity on every job.*

Any LINDE representative will gladly show you how the OXWELD CM-45 Machine Carriage will help you turn out more work in less time. Call the nearest LINDE office today for a free demonstration.

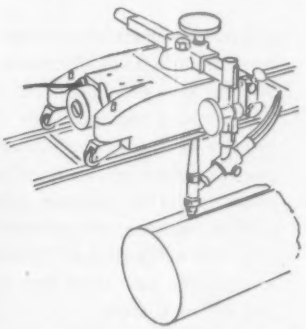
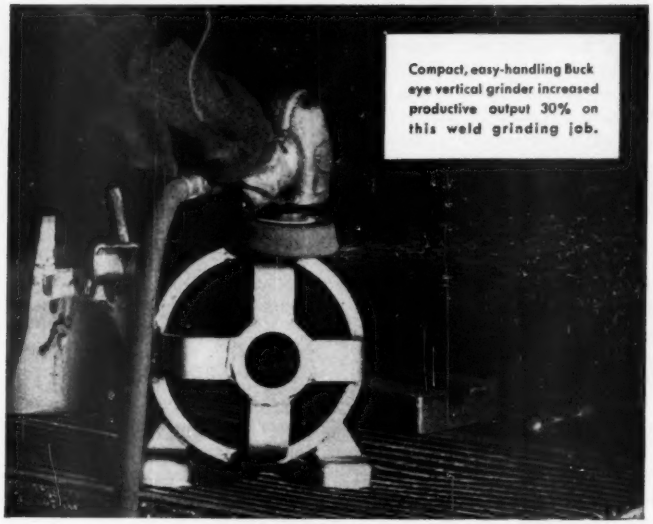


*Fig. 3—Do special welding jobs, such as tube fabrication, quickly with the CM-45. Rejects are reduced to a minimum.*

The terms "Linde" and "Oxweld" are registered trade-marks of Union Carbide and Carbon Corporation.

**LINDE AIR PRODUCTS COMPANY**
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: Dominion Oxygen Company, Limited, Toronto

# ▶ increases output 30% on grinding operations



Compact, easy-handling Buckeye vertical grinder increased productive output 30% on this weld grinding job.

In a routine check of production operations, a welding equipment manufacturer discovered a grinder operating well below the RPM recommended for the work being done.

Replacing this tool with a Buckeye 6,000 RPM vertical grinder resulted in an immediate increase of 30% in productive output on this grinding job. In addition, the lighter, more powerful Buckeye grinder helped improve product quality, reduce tool maintenance costs, employee fatigue.

All of which proves it's very important to select the right tool for the job—and very expensive to go on using older, less efficient tools.

## ▶ what are you waiting for?

The right tool for your job may well be described in the Buckeye air or electric tools catalogs. We'd like to send you either—or both—without obligation, of course.

**Buckeye Tools** CORPORATION

DIVISION 13 • DAYTON 1, OHIO

Portable Air and Electric Tools for Industry

IN CANADA: Joy Manufacturing Co. (Canada) Ltd., Galt, Ontario


MEASURING & CONTROL EQUIPMENT

*Begins on page 184*

For production control, and . . .

. . . for quality control . . .

### Two Industrial Computers

The OSP (Off-Schedule Production) computer, top picture, automatically and continuously shows you any deviation from a pre-set production schedule. Does away with slow and costly computation to determine whether your production schedules are being met.

You can easily read the large dial with "Behind Schedule" scale on left, "Ahead of Schedule" on right, and "On Schedule" at center, as shown. Dial has range of 1 to 14 units, with a built-in, manually operated multiplier of 1-10, 15, and 25. Simple time setting dial ranges from 5 seconds to 5 minutes and 20 seconds.

The OSR (Off-Schedule Rejects) computer is shown in bottom picture. With it you can eliminate unnecessary rejects and slow data computation. It consists of an automatic master unit and any number of reject analyzers.

Both OSP and OSR units operate on 110 volts, 60-cycle d-c.

**Industrial Computer Corp., 272 Lembeck Ave., Jersey City, N.J.**

*Turn the page*

# *Eliminate production breakdowns!*

## . . . With I-T-E CIRCUIT BREAKERS

When power interruption idles key production equipment, the tie-up is felt all along the line. While the operator waits for a maintenance electrician to restore service, other workers—from section foreman to plant production manager—see their tight production schedules being shattered.

All protective equipment is designed to shut off power as soon as any trouble develops. Circuit breakers *properly* protect costly capital equipment and allow the swift restoration of service necessary for continuous profitable production. But only a true *industrial* type breaker can meet the requirements of everyday use.

I-T-E Molded Case Circuit Breakers are designed and built for industrial use by circuit breaker specialists. They assure maximum production continuity because they:

1. Cut machine down-time. Operators can immediately reset breakers to restore service.
2. Are pre-tested for accuracy. When you use a circuit breaker, you know the calibrated value. Repeated operation will not change that calibration.
3. Will carry full rated load indefinitely. Protective value doesn't lessen with age.
4. Are completely safe for operators and maintenance men. No live parts are exposed!

There is a complete line of I-T-E Molded Case Circuit Breakers in ratings up to 600 volts a-c, 250 volts d-c, and 10 to 600 amperes. All ratings are available in four enclosure types.

For further information on I-T-E Circuit Breakers, see your local distributor or write I-T-E Circuit Breaker Company, 19th and Hamilton Streets, Philadelphia 30, Pennsylvania.

INSTALL

I-T-E

MOLDED CASE CIRCUIT BREAKERS

I-T-E CIRCUIT BREAKER CO. • 19th and HAMILTON STS. • PHILA. 30, PA.

Canadian Mfg. and Sales: Eastern Power Devices, Ltd., Toronto • Export Sales: Philips Export Corp., N.Y. 17, N.Y.

You'll find
**DEMING SUMP PUMPS**
in the most unexpected places!

● Ordinarily, you'll find Deming Sump Pumps on such jobs as sump drainage, or pumping heavy viscous or hot liquids in chemical or metallurgical work or performing many other "normal" jobs of liquid handling.

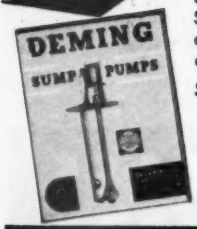
But you'll also find these versatile pumps as component units of other equipment, such as illustrated above. Here you see a standard Fig. 4610 Deming Sump Pump as a component part of the Kelly Sulphur Filter, engineered and manufactured as a standard "PACKAGED" unit by Oliver United Filters Inc.

Function of the Deming Sump Pump is pumping a mixture of filteraid and pre-clarified molten sulphur through the Kelly type pressure filter. This operation precoats the filter leaves with a layer of clean filteraid . . . thereby aiding the clarification of the dirty sulphur during the processing and producing an easily discharged cake.

SEND FOR BULLETIN No. 4607

Service of the Deming Sump Pump involves a capacity up to 60 gallons per minute at discharge heads not exceeding 20 PSI at temperature from 280 to 290°F.

Somewhere in the complete line of standard Deming Sump Pumps, you, too, may discover the most efficient and economical solution to your problem of liquid handling.



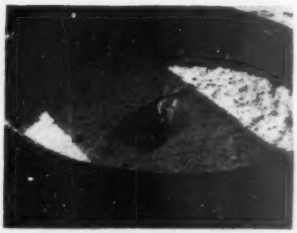

***Suggestion:***
*Send for illustrated SUMP PUMP BULLETIN 4600A.*

**THE DEMING COMPANY**
530 Broadway • Salem, Ohio

**DEMING** DEMING DEPENDABLE PUMPS **PUMPS**


*Begins on page 152*

# SAFETY & PLANT PROTECTION



## Alcohol-Resistant Foam

Pyrene's new all-purpose foam closes the last gap in your defense against flammable-liquid fires. It is said to be the most stable ever developed — many times more stable than any air or chemical foam now in use.

Called Alcohol Resistant Foam compound, it makes bubbles that are immune to the affinity the alcohols and other water soluble solvents — the ethers, esters, and ketones — have for water. This affinity destroys ordinary foam as fast as it is laid on a fire.

Picture above shows you a section cut out of foam covering alcohol fire, with alcohol underneath re-ignited. You can see that fire has not injured foam.

Because the alcohol-resistant foam covers an extinguished fire for hours with a protective blanket, it prevents re-igniting, a common hazard in volatile liquids.

New compound has passed all tests required by Underwriters' Laboratories, and UL approval for use on water soluble solvents, oils, and other hydrocarbons is expected.

**Pyrene Mfg. Co., 560 Belmont Ave., Newark 8, N. J.**

*Turn the page*

*Better gear protection*
*when you need it!**

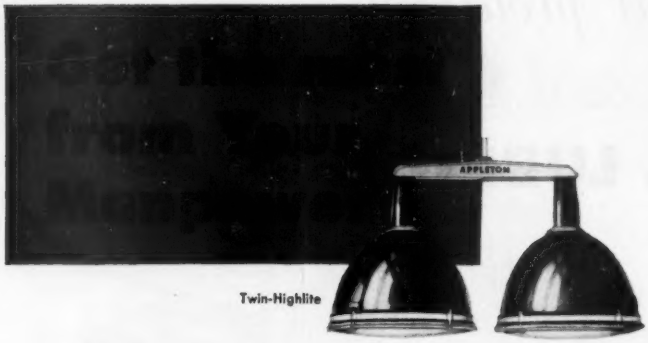
# —GULF E. P. LUBRICANTS

With Gulf E.P. Lubricants you get extra protection against gear troubles when production demands call for a speed-up of equipment or when unusually heavy tooth loads are developed. They are specially compounded to prevent metal-to-metal contact and help protect against pitting, spalling, and excessive wear.

For specific recommendations for your equipment, call in a Gulf Sales Engineer today. Write, wire or phone your nearest Gulf Office.

**Gulf Oil Corporation · Gulf Refining Company**
**Pittsburgh 30, Pa.**

GULF INDUSTRIAL LUBRICATION



Twin-Highlite

• Good light quickly pays for itself in increased worker output. And Appleton Lighting Equipment is precision-built to provide your personnel with the good light necessary for maximum efficiency, high morale.

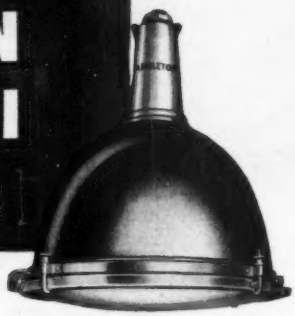
Appleton Fixtures are easy to install, easy to service. They're made to make the most of the lamp's power. Appleton reflectors distribute light evenly, without glare or troublesome fuzziness.

Plan lighting carefully for greater productivity per unit of personnel. And whatever your fixture requirements, specify Appleton, pace-setting manufacturer of electrical equipment for nearly half a century.

EFU Explosion-Proof Fluorescent
Pat. No. 2,392,202

Stocklite

**APPLETON Industrial Lighting**


Industrialite

*Sold Through Electrical Wholesalers*

**APPLETON ELECTRIC COMPANY**

1715 Wellington Avenue • Chicago 13, Illinois

*CONDUIT FITTINGS • LIGHTING EQUIPMENT • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES*

*Sales Engineers in All Principal Markets*


## SAFETY & PLANT PROTECTION

*Begins on page 192*

### Triple-Threat Fire Extinguisher Cart

This grab-and-run unit rolls three fire extinguishers into emergency area. Gives you an on-the-spot choice of quenching, blanketing, or non-conducting extinguishing agent, depending on type of fire.

**The General Detroit Corp., 2272 E. Jefferson Ave., Detroit 7, or The General Pacific Corp., 1501 E. Washington Blvd., Los Angeles 21.**

■

### Heat-Resistant Gloves

These all-leather gloves are said to be able to handle temperatures up to 800F. They are described as pliable and durable. Soft, flexible leather is impregnated with insulating and refractory materials.

**Mine Safety Appliances Co., Pittsburgh 8.**

*Turn the page*

Presto... it's UP!

17 ft.

"UP-RIGHT"

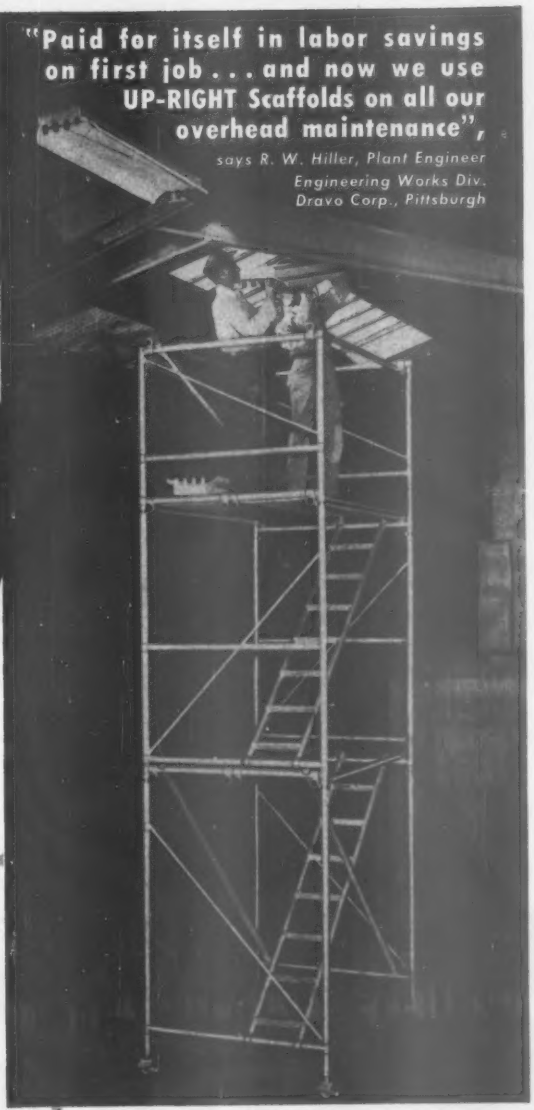
SCAFFOLD-ON-WHEELS

set up in only 3 minutes!

As if by magic, an aluminum alloy tower of any height desired is ready in minutes! Individual scaffold sections are set one on top of the other. Sections lock into place instantly.

"Paid for itself in labor savings on first job . . . and now we use UP-RIGHT Scaffolds on all our overhead maintenance",

says R. W. Hiller, Plant Engineer
Engineering Works Div.
Dravo Corp., Pittsburgh

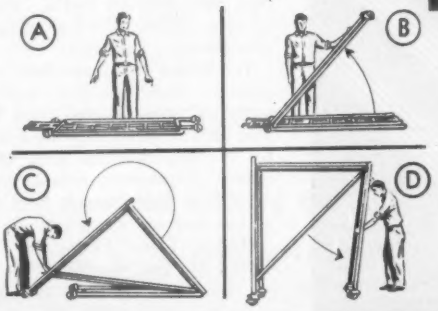


HERE'S THE SECRET!...

PATENTED

ONE-PIECE SECTIONS

Each one-piece section is unfolded by one man in less than a minute! No tools, wing nuts or bolts.




Your maintenance costs can be reduced by "UP-RIGHT" SCAFFOLDS

WRITE FOR DESCRIPTIVE CIRCULAR

"UP-RIGHT" SCAFFOLDS

DEPT. 104 • 1013 PARDEE ST. • BERKELEY, CAL.

Factories: Berkeley, Calif. & Teterboro, N. J.

*Offices in all principal cities*

That's right, tools aren't needed to recharge an Ansul Dry Chemical Fire Extinguisher. Nor is it necessary to send the extinguisher away for recharging. After use, even the most inexperienced operator can quickly recharge an Ansul Dry Chemical Fire Extinguisher. This assures you of continuing fire protection.

Ansul Dry Chemical Fire Extinguishers are approved for Class "B" and Class "C" fires by the Underwriter's Laboratories Inc., Factory Mutual Laboratories, and the U. S. Coast Guard. Field experience has proved Ansul Extinguishers are your best protection for flammable liquid, gas and electrical fires.

SEE PAGE 228

CUT SHEET METAL
"slick as a whistle"

USE IN YOUR HAND DRILL. ¼" drive shank. A punch and die that cuts 7 ft. per min. at 2000 R.P.M., straight lines or curves.

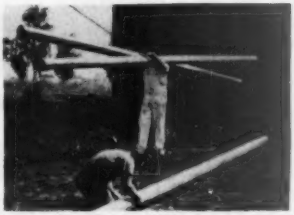
order yours today shipped on 10 day free trial

Price only $13.75
extra punch—$3.15
f.o.b. DENVILLE
write for descriptive folder

Nord INTERNATIONAL CORP.
P. O. BOX 44F, DENVILLE, N. J.



# VALVES & PIPING



## Plastic Pipe for Pressure Transmission

This new thermosetting plastic pipe is reinforced with glass fiber and is said to overcome many limitations of plastic pipe now used for corrosion service pressure transmission.

Makers say it is not affected by electrolytic corrosion, a major problem facing pipe users. Operating temperatures range from −90 to +230F. Working pressure is 200 psi. Available in 4-, 6-, 8-, and 10-in. O.D. in 20-ft. lengths.

**Reflin Co., Box 452, Gardena, Calif.**

■

## Excess Flow Shut-Off

You can check run-away flow rates resulting from line breaks and process upsets with the new Sentry balanced diaphragm excess flow shut-off valve. Unit actuates instantly when regular flow rates are exceeded.

The Sentry valve introduces no pressure drop into line, and a valve of same nominal size as that of line itself may be used. By changes in orifice sizes and spring adjustments, normal and emergency flow controls may be varied over a wide range.

**McRae Valve Corp., 621 S. Spring St., Los Angeles 14.**

*Turn the page*

# *Meet your* B-RIGHT-ON *dealer*

Just as you must know your customers' needs . . . he knows yours. He really understands . . . as does every Brighton franchise holder . . . the uses and applications of socket screws . . . and is ready at any time to advise you.

One of his most important functions is to give you prompt service. He's johnny-on-the-spot . . . filling your order from his adequate stock, backed up by centrally located Brighton factory stocks.

He's proud of Brighton Screws . . . they're a real quality line . . . meeting all of your requirements, including the highest standards of strength, accuracy and uniformity.

Make your Brighton dealer a member of your production team . . . get his help on *any* socket screw question. If you're not already acquainted . . . write for his name.

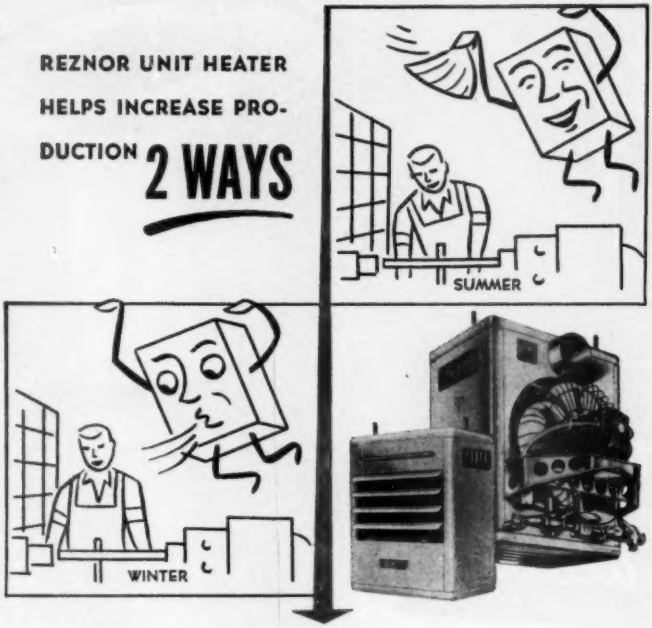
- Socket Set Screws
- Socket Cap Screws
- Socket Head Stripper Bolts
- Socket Pipe Plugs

**THE BRIGHTON SCREW & MANUFACTURING CO.**

QUALITY B-RIGHT-ON PRODUCTS ®

Reading Road opposite Deer Creek
Cincinnati 2, Ohio

REZNOR UNIT HEATER HELPS INCREASE PRODUCTION **2 WAYS**




Imagine being cooled by a heater in July? Reznor does just that . . . huge volumes of invigorating air are circulated every second by Reznor's powerful fan. Nature's natural refrigerator, perspiration, accompanied by Reznor's air circulation, brings the body temperature down to accomplish the cooling. A comfortable worker is a contented worker who produces more units per hour.

With fall's first chilling drop in temperature, Reznor's push-button control spreads delicately controlled and evenly distributed warmth. Floor mounted or ceiling suspended at any level, either cooling air or warming air are directed precisely where wanted.

Yes, you increase production two ways with Reznor. You provide both cooling comfort in the summer and warmth in the winter with each Reznor unit heater.

★ ★ ★

*Installation with gas, flue and electric lines is so simple that addition of rooms or buildings imposes no heating problems. . . . Specify Reznor, and install now.*

*See Sweet's Catalog*

**REZNOR**

THE WORLD'S LARGEST-SELLING GAS UNIT HEATER

*Send for catalog TODAY*

REZNOR MANUFACTURING CO.
46 UNION ST. · MERCER, PENNA.
*Send me 20-page Catalog in Full Color*

NAME_____

FIRM_____

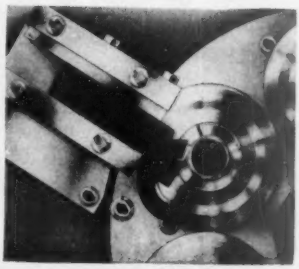
ADDRESS_____

CITY_____ ZONE____ STATE_____



*Begins on page 152*

# MISCELLANEOUS



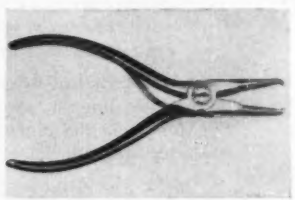
## New Cut-Off Tool

Cutting edge is on outside diameter of semi-circular disc of finest-grade high-speed steel. Blade is mounted in holder with all but cutting edge protected by envelope or shroud.

Tool has greater rigidity, flat cut, and no chatter. Needs no adjustment after grinding and uses thinner blades for savings in material.

**New Britain Machine Co., New Britain, Conn.**

■



## Transverse End Cutting Plier

Makes it possible for you to reach into confined places and make a clean, flush cut. Also highly useful in precision work where ordinary oblique and end cutters are too bulky.

Plier is hammer-forged from high-grade tool steel and is available in 6-in. size only.

**Mathias Klein & Sons, 3200 Belmont Ave., Chicago 18.**

*Turn the page*

# ...FROM HELL TO THE NORTH POLE *and back again*

Checking the temperature of an aircraft test assembly in the High Temperature Chamber at 200° F.

Aero-hydraulic swivel joint assembly being taken from the Cold Chamber where it has been subjected to 75° below zero temperature for 168 hours.

Heavy duty Rotator and Oscillator testing an aero-pneumatic swivel joint assembly used on the wing flaps of a Navy dive-bomber.

## CHIKSAN Hydraulic Swivel Joints tested in "Torture Chambers"

Despite the ever-increasing demands of Industry and the Armed Services, when it comes to setting rugged specifications Chiksan is its own harshest judge.

No Chiksan Hydraulic Ball Bearing Swivel Joint that can't pass the punishing tests of Chiksan "Torture Chambers" ever gets onto our loading platform, let alone actual use!

A pulse pressure generator where aircraft and ordnance hydraulic joints are subjected to shock pulses to 10,000 psi 240 times per minute.

There's an Arctic Chamber where the temperature drops to 75 degrees below zero to find out how metals, packings and working parts will react in most extreme cold. The Equatorial Box sends the thermometer soaring up to a sweltering 200 degrees to learn if Chiksan Joints can take it.

In the case of 3000 psi tests Hydraulic Joints are subjected to shock pressures from 0 to 4250 psi, 35 times a minute for 100,000 cycles. In testing special ordnance this rate has been stepped up to 240 times a minute at 0 to 10,000 psi. All test equipment has been designed and developed by Chiksan Engineers.

Every requirement of #MIL-J-5513 A is met—and in the case of Hydraulic Swivel Joints shipped for private use, standards are equally exacting.

No wonder Industry and Defense rely upon Chiksan to speed the flow of enterprise—to *keep* it flowing in a swift, reliable stream!

*The Flow of Enterprise Relies on*

**CHIKSAN**

*Ball-Bearing Swivel Joints*

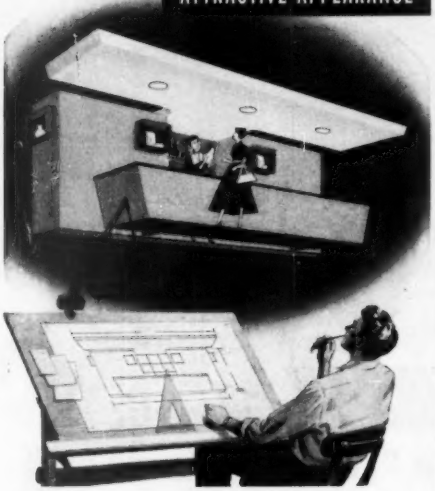
Representatives in Principal Cities
Write for Catalog 2A, Dept. 12-FMM

**CHIKSAN COMPANY • BREA, CALIFORNIA • Chicago 28, Illinois • Newark 2, New Jersey**

Well Equipment Mfg. Corp. (Division), Houston 1, Texas • Chiksan Export Company (Subsidiary), Brea, California • Newark 2, N. J.

# Only plywood gives you all 6

ATTRACTIVE APPEARANCE



DOUGLAS FIR PLYWOOD has the warmth and charm of real wood . . . the natural texture and "feel". And why not? For this is one panel material that *is* real wood . . . not "re-worked" . . . chemically unchanged. Versatile plywood takes any finish—paint, in modern enamel, decorator colors . . . varnish, lacquer . . . or smart light-stains that capitalize on the beauty of the natural grain.

Add this to plywood's many other advantages and you'll see why it is preferred for fixtures and furniture . . . paneling and cabinets . . . displays and partitions . . . siding and signs. No other building material does so many jobs so well.

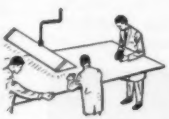
For further information, write Douglas Fir Plywood Association, Dept. 4912, Tacoma 2, Washington.

1 Attractive Appearance

2 Workability

3 Cross Laminated Strength

4 Large Panel Size



5 Tested Quality

6 Light Weight

Douglas fir plywood is real wood, made by "unwinding" giant logs

into thin wood sheets which are inseparably cross-laminated

to form large, light panels having beauty and great strength

Douglas Fir Plywood

AMERICA'S BUSIEST BUILDING AND INDUSTRIAL MATERIAL


MISCELLANEOUS EQUIPMENT

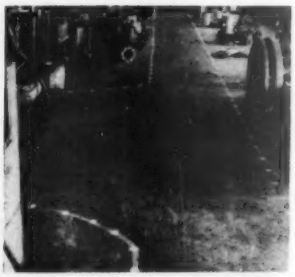
*Begins on page 198*

## Locker That Breathes

Keeps your employees' working and street clothes fresh, dry, and odor-free at all times. Locker can be recessed in wall or mounted on island base. And has a shoe rack, hat holder, shelf, coat rod and hooks, and automatic locking device.

**Penn Metal Corp. of Penna., Philadelphia 48.**

■



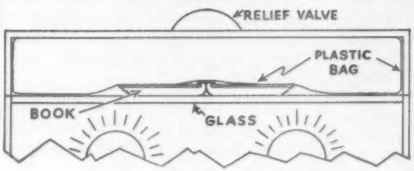
## For Marking Traffic Lanes

Bright yellow or white plastic disks for lane marking save you time and money by eliminating repainting. They last 2 to 5 years under heavy plant traffic, maker claims.

Tapered up to a ¼-in. high center, discs warn your vehicle operators by feel as well as sight. And they resist effects of oil, grease, hydrocarbons, or ordinary cleaning solvents.

**Canton Containers, Inc., 1101 Ninth St., S.E., Canton 2, Ohio.**

*Turn the page*



# New Peerless Photocopy Printer with "Pneumatic Cushion"

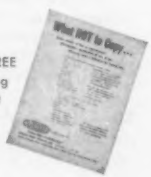
## Makes Books, Records and other Thick Material Easy to Copy

A revolutionary idea in photocopy! This Peerless model F-1 printer maintains perfect control over entire printing area with material up to 1½" thick. Now you can photocopy pages in books, bound records, pamphlets and other thick material with the same ease and results as with standard single-sheet copies. The reason is the Peerless "pneumatic cushion" which *automatically* adjusts to the correct pressure for perfect contact. This newly-developed feature consists of an air-filled plastic cushion located in the lid of the printer. When the lid is closed, sufficient air is displaced through the relief valve to permit the plastic bag to make overall blanket-like contact with the material to be copied. When work is finished simply inflate cushion to original size with a hand pump.

The Peerless model F-1 photocopy printer is a low-cost unit designed for shop or commercial use; particularly where both single-sheet and bulky material must be copied economically and efficiently. The compact model F-1 is constructed of selected hardwoods with chrome-finished fittings. It is equipped with a plate covering the plastic cushion for best single-sheet photocopy results. The lamp arrangement insures even illumination over the entire 15" x 19" printing area. It also features a permanently installed filter for making reflex prints. Fast, accurate and economical, model F-1 is an important addition to modern photocopy equipment.

Send for free brochure and full particulars.

ALSO SEND FOR FREE wall chart describing material which cannot legally be photocopied.




**PEERLESS PHOTO PRODUCTS, INC.**

***"Know-how in Photocopy"***

**PEERLESS PHOTO PRODUCTS, INC.,** SHOREHAM, L. I., NEW YORK

Distributors in: Los Angeles • Chicago • Cleveland • Detroit • Pittsburgh • Buffalo • Tulsa • Dallas • Houston • Salt Lake City • Atlanta

# *New* Flexible Sealing...

## T-J AIR CYLINDER

**Designed with revolutionary application of**

## *Super-Cushion*

It's *sealed with pressure*—a revolutionary T-J application of flexible sealing that insures positive cushion action combined with automatic valving action for fast return stroke . . . eliminates binding and sticking . . . operates with *low friction, minimum wear,* and *added power* due to higher efficiency.

*More PLUS features!* New type packing nut incorporates a piloted diameter, assuring perfect alignment. Improved rod packing increases sealing efficiency. Piston rod and internal cylinder tube surfaces are hard chrome plated—a standard practice with T-J for over 15 years.

**Write for bulletin 252. The Tomkins-Johnson Co., Jackson, Mich.**

1. Metallic rod scraper to protect rod bearing and packing from dirt and grit.
2. Wrench flats.
3. Self-adjusting chevron type packing.
4. Permanent type adaptor ring.
5. Hi-tensile tie rods.
6. Heavy duty, hard chrome plated rod.
7. Generous fillet reduces stress concentration.
8. "O" ring static seal.
9. T-J new flexible cushion seal insures positive cushion with automatic valve action for fast return stroke. (Patent applied for)
10. Fine cushion adjustment.
11. Heavy wall precision honed hard chrome plate.
12. Controlled packing compression with metal to metal contact.

**36 YEARS' EXPERIENCE** (T-J)

**TOMKINS-JOHNSON**

RIVITORS · AIR AND HYDRAULIC CYLINDERS · CUTTERS · CLINCHORS


MISCELLANEOUS EQUIPMENT

*Begins on page 198*

### Flexible Vise

It's really a "third hand" for your machinery workmen, says maker. Swivel makes it easy to do many things that are awkward or practically impossible with conventional vise.

You can use vise with a surface-grinding attachment, for angle tapping, and for drilling at any angle.

**F. E. Bellows Mfg. Co., Dallas.**

■

### Automatic Dispenser

Prevents evaporation of frequently used volatile fluids and eliminates removing and replacing bottle stopper.

When you press down on unit, fluid pumps up into dispensing dish. And you can adjust rate of flow from 3 to 15 drops per stroke.

Spillproof stainless steel dispenser prevents evaporation and reduces fire hazard. Unbreakable polyethylene plastic bottle holds 6 ounces and is inert to chemical action.

**Menda Co., 279 North Hill Ave., Pasadena 4, Calif.**

*Turn the page*

**FAIRBANKS-MORSE DIESELS CAN BE YOUR**

# Power Keys

Here are the keys that have opened the way to adequate, reliable power for many plants — small and large. They have eliminated the penalty paid due to poor power factor, surge loads and adverse current characteristics.

**But, Will They Fit Your Problem?**

Look at the list! Would compact in-plant power generation unlock your plans for plant expansion . . . eliminate the need of using purchased power at rates based on *high* peak demand values . . . add to current capacity? The answer is yes—and it can mean the difference between profit and loss in your plant.

If you are seeking the keys to your power problem, write us today, outlining your needs. Fairbanks-Morse engineering can give you a *proved* answer . . . based on over 50 years' experience in industrial and municipal power generation. Fairbanks, Morse & Co., Chicago 5, Ill.

## Put Your Power Costs and Performance in Order

1 ***Handle Peak Demand*** . . . reduce peak demand values for lower purchased power rates.

2 ***Power Factor*** . . . in-plant power generator can eliminate power factor penalties.

3 ***Emergency Power*** . . . insurance against lost production and damage resulting from line failures

4 ***Handle Surge Loads*** . . . that may now be affecting current characteristics of entire plant.

5 ***Plant Expansion*** . . . need not be restricted due to lack—or expense—of ample power.

6 ***Useful Heat*** . . . lube oil, water and exhaust heat can be turned from waste to profit.

7 ***Chemical Value*** . . . exhaust gases are high in free nitrogen—available for economical fixation of nitrates, ammonia, etc.

8 ***Insurance Advantage*** . . . of diesel over gasoline engine, for example, will soon pay for installation.

9 ***No Weather Worries*** . . . ice, snow, sleet, wind storms can't stop plant operations.

10 ***Handle Increasing Load*** . . . in-plant power economically adds to current capacity as loads increase.

11 ***Fuel Economy*** . . . use diesel oil, natural gas or sewage gas for added economy.

12 ***Remote Locations*** . . . distance from transmission lines needn't curtail plant expansion.

13 ***More Compact Power*** . . . Fairbanks-Morse engines give you more power per foot of floor space, more power on present foundation.

14 ***Minimum Attendance*** . . . Fairbanks-Morse in-plant generating sets require far less supervision or maintenance.

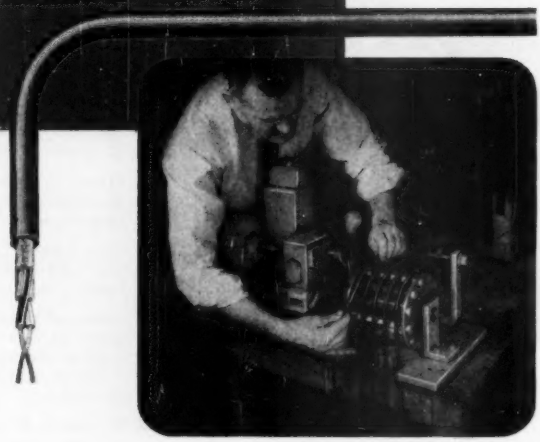
15 ***Save Cost*** . . . of running in new line where present transformers and power lines are already loaded.

**FAIRBANKS-MORSE,**

*a name worth remembering when you want the best*

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • ELECTRICAL MACHINERY • PUMPS • SCALES • RAIL CARS • MAGNETOS • FARM MACHINERY

THERE'S NO QUESTION
About the High Quality
OF
DYNAPRENE
*Flexible Cord*



Everything that goes into the making of DYNAPRENE Flexible Cord is checked and tested for quality. Whitney Blake is proud of the reputation for long life and hard service that DYNAPRENE has earned. You can be sure that this good reputation will be carefully safeguarded.

Only by using flexible cord of the finest quality can a manufacturer be sure that his electrical products will give completely satisfactory performance. It was to meet manufacturers' demands for a better flexible cord that the rugged neoprene compound used for DYNAPRENE jackets was developed. DYNAPRENE is tough and long lasting, it is extra flexible and unusually resistant to those substances and conditions that play havoc with rubber-jacketed cords. Safeguard your product's performance by specifying Whitney Blake DYNAPRENE SO, SJO and SV-neoprene-jacketed type on your next requisition.

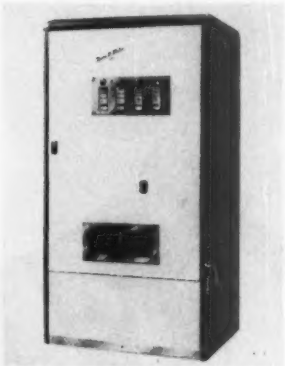
WELL BUILT WIRES SINCE 1899

WHITNEY BLAKE CO.

NEW HAVEN 14, CONNECTICUT

MISCELLANEOUS EQUIPMENT

*Begins on page 198*



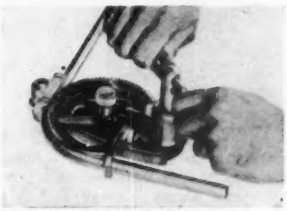
## Automatic Milk Vendor

This milkman is never late. Serves ½-pt. or 1/3-qt. cartons to 4 people at the same time and has coin changers that permit selling at odd-cent prices.

Called the Dari-O-Matic 500, unit holds 512 cartons in vending and pre-cool stage.

**Fruit-O-Matic Mfg. Co., 5225 Wilshire Blvd., Los Angeles 36.**

■



## Compact Tube Bender

You can bend any kind of tubing, including hard-drawn copper and hard-temper steel, with this sturdy bender.

Unit can be positioned at any point on tube and can be used when one end of tube is connected.

Available for tubing from ⅜- to 1⅛-in. O.D. (¼- to 1-in. nominal size).

**Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago 7.**

*Turn to page 357*

# GOOD NEWS!

## NOW-Grind Carbide Tools WITHOUT Diamonds

**With Light Wrist-Pressure,** under steady coolant flow, these BAY STATE wheels:

1. ***FINISH-GRIND*** **CARBIDE SINGLE POINT TOOLS.**
2. **CUT AS FAST AS DIAMOND WHEELS.**
3. **CUT COSTS TO A MINIMUM.**

**IMMEDIATELY AVAILABLE FROM STOCK,** these new BAY STATE specifications have been especially developed to help you meet the present and continuing diamond shortage.

**TO KEEP PRODUCTION GOING**
**TO SAVE HARD-TO-GET DIAMOND WHEELS**
**TO KEEP CARBIDE CUTTING EDGES KEEN**

*Take advantage of Bay State's Advanced Engineering.*

**BAY STATE**

**ORDER A TRIAL WHEEL TODAY**

**BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass., U.S.A.**

Branch Offices and Warehouses: Chicago, Cleveland, Detroit, Pittsburgh
Distributors — All Principal Cities
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

WHAT *Life-Lines* REALLY DELIVER IS MORE SERVICE...LESS SERVICING

# How to spot a truly pre-lubricated motor

You are looking at the first motor made to utilize pre-lubrication to its *utmost.* Notice the bearing hub. It was *designed* for a pre-lubricated bearing. There are *no* grease fittings or plugs. The way to grease this modern motor is *don't.*

Westinghouse—the pioneer in pre-lubricated motors—announced in 1948, after 15 years of tests in the laboratory and on the job throughout industry, that Life-Line motors needed no further lubrication. That meant what it said; still means it. You don't have to lubricate them in six months or six years. You don't have to lubricate them—period!

This means you can't grease a Life-Line motor incorrectly. No chance to push dirt into bearings . . . to force grease through seals and into windings. No chance for greasing errors at all! Lubrication problems are out.

So be sure you get a truly pre-lubricated motor. Look for one that has no grease fittings. You'll know then it means what it says and needs no greasing attention. You'll find your answer in Life-Lines. Remember this is but one reason why Life-Lines offer you more service on the job . . . less servicing.

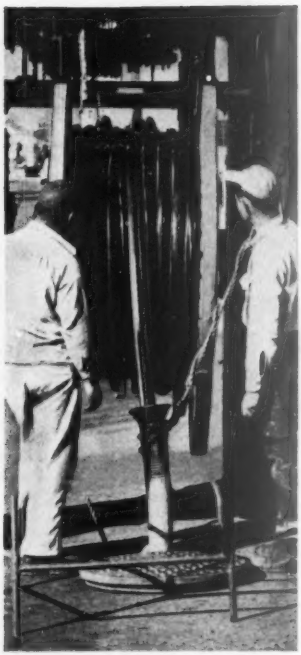
Ask your Westinghouse representative about other reasons—all steel construction and greater electrical strength. And ask for a free copy of "Facts on Pre-Lubricated Bearings" (B-4378), or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21705-A

YOU CAN BE SURE... IF IT'S

Westinghouse

DIRECT BURIAL

OVERHEAD



IN DUCTS

# Low-cost way to hit the **high** and **low** spots—

# use All-Purpose DURASHEATH

**DURABLE** DURASHEATH* can be used for every type of power and lighting application up to 15kv**. The most important fact about this all-purpose cable is that it may be run *overhead, buried directly underground* and run *in ducts* in one continuous length. Expensive splicing is avoided. Durasheath eliminates sheath electrolysis. It effectively resists condensation, weathering, sunlight, organic decay, abrasion and mechanical injury.

You can look for *three* definite savings with Durasheath. It costs less to install. It is flexible and light. It lasts longer. Its special neoprene jacket is tough enough to stand up to every natural enemy of cable life. It simplifies stock inventory. You need purchase only *one* cable—versatile Durasheath—to meet every electrical distribution requirement.

Ask your nearest Anaconda Sales Office or Distributor for the whole story on Durasheath. Then convince yourself how much you will save by using Durasheath. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

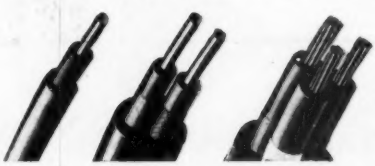
*Trademark 528008

## the right cable for the job ANACONDA®

## wire and cable

available in all sizes—from large to small—single and multi-conductor.

for traffic control, airport† power and lighting, mines, industrial plants, railroads, street lighting, and many other uses.



†when ordered to CAA Specifications L-824.

**for voltages over 5kv consultation with Anaconda Engineers is recommended.

making the right
choice is simple here

# ...but it's easy to go wrong in choosing floors

*This SPECIAL greaseproof KENTILE Floor resists hot cooking greases and oils . . . cleans to colorful newness with minimum of effort and expense.*

**THAT'S WHY IT PAYS TO CONSULT YOUR KENTILE FLOORING CONTRACTOR**

CHOOSING the wrong floor for a particular room or area all too often results in excessive upkeep costs...frequent repairs or replacement. That's why it is economical as well as practical to call in the Kentile Flooring Contractor.

He is an expert with years of experience in selecting the one right floor for every flooring need...from heavy duty greaseproof flooring required for working areas to the dignified flooring best suited for offices.

Whether your problem is new construction or remodeling of areas large or small, call in the Kentile Flooring Contractor and get the most for your flooring dollar. For his name look in your classified phone book under FLOORS or write Kentile, Inc., Dept. TT-10, Brooklyn 15, N. Y. In Canada, at T. Eaton Co. Ltd.

**KENTILE INC.**

**KENTILE • KENRUBBER • KENCORK**
**SPECIAL (greaseproof) KENTILE**

KENTILE, INC., 58 Second Avenue, Brooklyn 15, New York • 350 Fifth Avenue, New York 1, N. Y. • 705 Architects Building, 17th and Sansom Streets, Philadelphia 3, Pennsylvania • 1211 NBC Building, Cleveland 14, Ohio • 900 Peachtree Street N.E., Atlanta 5, Georgia • 2020 Walnut Street, Kansas City 8, Missouri • 4532 South Kolin Avenue, Chicago 32, Illinois • 1113 Vine Street, Houston 1, Texas • 4501 Santa Fe Avenue, Los Angeles 58, California • 452 Statler Building, Boston 16, Massachusetts

# SIGNIFICANT DEVELOPMENTS IN PRACTICAL LABOR RELATIONS

## TOLD IN BRIEF FOR BUSY FACTORY EXECUTIVES

By **PAUL A. KING**, *Attorney, Bigelow-Sanford Carpet Company, Inc. Member, New York Bar.*

**RETROACTIVE WAGE BOOSTS FOR TERMINATED WORKERS.** *Not required under wage stabilization rules, says WSB.* . **Page 210**

**HOW LONG CAN A UNION-SHOP CLAUSE LAST?** *As long as the employees do not vote to eliminate it, says a new ruling.* **Page 210**

**GET THE GOODS ON EMPLOYEE BOOKMAKERS.** *One arbitrator reversed a discharge because the evidence wasn't strong enough* . . . . . **Page 214**

**WHAT IS "GOOD-FAITH" BARGAINING?** *It's your over-all conduct that really counts in defining good faith* . . . **Page 214**

**ARE YOU THE SOLE JUDGE OF A FAIR DAY'S WORK?** *Here's an arbitrator who thinks not—under some circumstances.* **Page 216**

**TEST OF LONG-TERM PENSION CONTRACTS COMING.** *Looks as if 5-year contracts won't last that long* . . . . . **Page 218**

**INTERSTATE EMPLOYER NOT FREE OF STATE LABOR LAWS.** *Union security clauses are a good example.* . . . . . **Page 218**

**BRIEF BUT IMPORTANT.** *Limit on lockouts . . . Federal anti-racketeering act revived . . . New income tax withholding forms out . . . Contracts calls for pay for damaged clothes . . . Salary Stabilization violators being investigated.* . . . . . **Page 220**

### Retroactive Wage Boosts for Terminated Workers

You apply to the Wage Stabilization Board for approval of a retroactive wage increase. By the time approval is given, some of your workers have left. Are you required to pay those who left the amount of increase approved? Not as far as the Board is concerned. The matter is controlled by your union contract if you have one, or by any understanding or other agreement you may have had with your workers.

If no definite rule can be spotted, then it depends on your own good conscience.

### How Long Can a Union-Shop Clause Last?

A union-shop clause in a labor contract is good only so long as the employees do not vote to eliminate it. It is not binding for the duration of the contract.

This is a new interpretation of the Taft-Hartley Law's restrictions on union-shop contracts—recently handed down by the National Labor Relations Board. It is bound to come up in discussion of revision by Congress next year.

The decision, by a split 3-2 vote, establishes a significant precedent:

The right of a union to sign a union shop contract under Taft-Hartley is only conditional, and subject to revocation at any future time by a vote of the employees, although ordinarily a contract's provisions apply for the full term of the contract.

In this case, NLRB granted a union-shop decertification election requested by a group of employees in a Great Atlantic & Pacific Tea Co. bakery in New York City.

The Board rejected the argument of A&P and the Bakery Worker's Union that their 2-year contract covering these workers does not expire until next year.

In dispute was the interpretation and effect of the 1951 amendments to the Taft-Hartley Law, abolishing the old mandatory union shop authorization election.

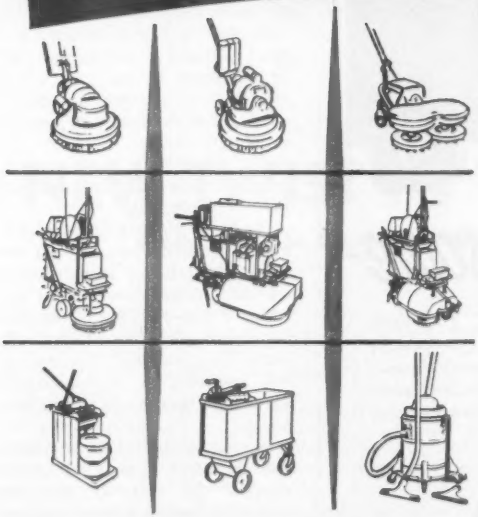
Until last year, the law provided that unions had to have ap-

# Keep your floor-maintenance men happy . . .

## with *Job-Fitted* EQUIPMENT!

**Choose from the COMPLETE *Finnell* Line**

**More than a score of models and sizes permits selection of the equipment that's exactly right for your job!**



**However much a maintenance man may want to do a good job, and at the same time show savings in labor costs, he's *stymied* if the machine is too small, or too large, or is otherwise unsuited to the job. Different floors and areas call for different care and equipment. That's why *Finnell makes more than a score of floor-maintenance machines.* From this complete line, it is possible to choose equipment that is correct in size as well as model . . . that provides the maximum brush coverage consistent with the area and arrangement of the floors.**

***Finnell* makes *Conventional Polishing-Scrubbing Machines* in both concentrated and divided-weight types, each in a full range of sizes . . . a *Dry-Scrubber*, with self-sharpening brushes, for cleaning grease-caked floors . . . *Combination Scrubber-Vac Machines* for small, vast, and intermediate operations, including gasoline as well as electric models . . . *Mop Trucks* . . . *Vacuum Cleaners* for wet and dry pick-up, including a model with By-Pass Motor. In addition, *Finnell* makes a full line of fast-acting *Cleansers* for machine-scrubbing . . . *Sealers* and *Waxes* of every requisite type . . . *Steel-Wool Pads*, and other accessories — *everything for floor care!***

**In keeping with the *Finnell* policy of rendering an individualized service, *Finnell maintains a nation-wide staff of floor specialists and engineers. There's a Finnell man near you* to help solve your particular floor-maintenance problems . . . to train your operators in the proper use of *Finnell Job-Fitted Equipment and Supplies* . . . and to make periodic check-ups. For consultation, demonstration, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 2512 East St., Elkhart, Ind. Branch Offices in all principal cities of the United States and Canada.**

**FINNELL SYSTEM, INC.**

*Originators of Power Scrubbing and Polishing Machines*

FINNELL

BRANCHES IN ALL PRINCIPAL CITIES

4-ton loads at 4-ft. x 12-ft. wallboard stored ceiling-high at Newark Plaster Co., So. Kearny, N. J.

*high, wide and then some-*

Long loads, loose loads, whoppers, or what have you . . . Towmotor makes short shift of putting *any* capacity-cargo anywhere you want it, right up to the rafters. Write for your copy of "Man-Hour Thieves," Towmotor's new guide to successful cost cutting procedures, and name of your nearest Towmotor Representative. Towmotor Corporation, Div. 5, 1226 E. 152nd St., Cleveland 10, Ohio.

TOWMOTOR
THE ONE-MAN-GANG ®

FORK LIFT TRUCKS and TRACTORS
SINCE 1919
RECEIVING • PROCESSING • STORAGE • DISTRIBUTION

# PRACTICAL LABOR RELATIONS

*Begins on page 210*

proval by a majority of employees before negotiating union-security clauses.

But voting results in the 4-year period showed that employee authorization was automatic in the vast majority of cases. As a result, Congress in 1951 eliminated the expensive, seemingly pointless procedure. But Congress retained a provision in the law permitting employees to withdraw their approval—in effect, to get out of a union shop through an NLRB election.

However, Taft-Hartley does not specifically define what effect a vote withdrawing authorization has on an existing union-security agreement.

A&P and the union contended before the Board that even if their 2-year contract did not bar the poll, the results should not take effect until the contract expired. They interpreted the 1951 amendments as limiting withdrawal of union-shop authorization only to extensions or renewals of agreements.

But Chairman Paul Herzog, and members John Houston and Ivar Peterson, said:

"Only by holding that an affirmative de-authorization vote immediately relieves employees of the obligations imposed by an existing union-security agreement can this Board give effect to the basic Congressional objective of not imposing a union-security agreement upon an unwilling majority."

A lengthy dissent by members Abe Murdock and Paul Styles charged the majority members with "legislating where Congress deliberately did not." The dissent said the Board's ruling would "critically injure the stability of bargaining relationships."

*Turn the page*

# NEW TWIST IN YARN SPINNING

## speeds up change-overs at Avondale Mills

AT ONE TIME changing yarn size in a spinning room was a major headache for textile mill operators. To change spinning speed, they had to change the drive pulley on each of a hundred or more spinning frames.

Today, Allis-Chalmers variable speed drives eliminate the need for this time-consuming, pulley-changing operation. Many mills, like Avondale in Sycamore, Alabama, use wide range *Vari-Pitch* drives, plus *Texslide* motor bases. With this equipment they can make accurate adjustment of spinning frame speed in a matter of seconds.

Used with these drives (above) are Allis-Chalmers *Quick-Clean* textile motors that blow themselves clear of lint. This coordinated equipment is another example of how Allis-Chalmers designs and builds equipment that helps industry produce more at lower costs—and so helps give you more for your money.

*Allis-Chalmers*
*Makes Machinery to Help*
*People Produce More—*
*Have More—*
*Enjoy More Leisure Time—*
*LIVE BETTER!*

*Vari-Pitch, Texslide* and *Quick-Clean* are Allis-Chalmers Trademarks.

# ALLIS-CHALMERS

A-C ALLIS-CHALMERS

*GENERAL MACHINERY DIVISION*

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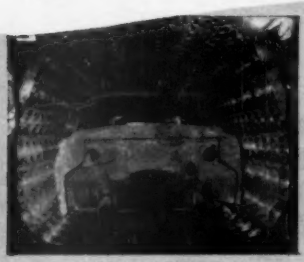
*Faster, Lower Cost, Less Space for*

# PRODUCT FINISHING

**PAINT BAKING • DEGREASING • COAT DRYING**

## FOSTORIA INFRA-RED
## Golden Wall Evenray Ovens



**Paint Baking at Kaiser-Frazer**

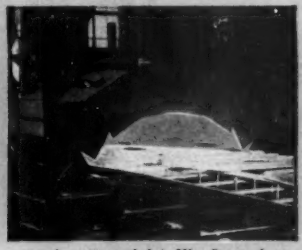
In this oven for body finish baking, controls vary heat for prime coat at 350°F for 12 minutes to finish lacquer coat at 175°F for 12 to 15 minutes. A smaller oven is used for smaller parts.

**Finishing Sub Net Floats at Eaton Metal**

Inside and outside zinc chromate and Navy gray finish coats are each baked in 12 minutes at 200°-250°F in these three small Fostoria ovens. Floats are 58" diameter, weight 1000 lbs.

**Coat Drying at Standard Steel Spring**

Protective coating sprayed on steel sheets before forming auto bumpers is dried in 1 minute eliminating bottleneck of former hot air drying. Production quadrupled.



**Drying (Porcelain) Slip Enamel at Athens Stove Works**

Dried in less than one minute in a Fostoria oven before high temperature firing. Photo shows one of two ovens used.

Cost reduction — a major problem in industry today — has been solved quickly by thousands of plants through the modern Fostoria Infra-red process for product finishing. Production results with Fostoria Infra-red Ovens are amazing. No other heating process approaches the speed, the ease of control, the low "per-piece" production cost of the high efficiency engineered Fostoria oven. Only Fostoria combines the highest efficiency energy source, lamp Infra-red, with the highest efficiency oven construction, Gold-lined Evenray oven walls. In productive use of energy, in uniformity of heat distribution, in flexibility of control and adaptability to any requirement, the Fostoria oven outperforms, outmodes, any other equipment. Write for the full facts, today!

INFRA-RED fostoria SYSTEM

THE FOSTORIA PRESSED STEEL CORP.
FOSTORIA, OHIO Dept F

Please send me information on Infra-red Ovens for .....

Name .....

Company .....

Street .....

City ..... State .....

# PRACTICAL LABOR RELATIONS

*Begins on page 210*

The majority assumed that since the A&P employees had never approved a union shop, the union's authority to have it "existed on a conditional basis only."

## Get the "Goods" on Employee Bookmakers

If you want to fire an employee for bookmaking be sure you can prove he was doing it on company time or property. Arbitrator I. Robert Feinberg re-instated a Bethlehem Steel employee fired for such activity because the evidence was insufficient. For a serious charge, carrying a serious penalty, the evidence must be clear and convincing.

## What Is "Good-Faith" Bargaining?

Case by case, the National Labor Relations Board is spelling out what "good-faith" bargaining means. In the latest, involving Union Carbide and Carbon, the Board emphasizes the importance of considering an employer's "whole pattern" of dealing with the union. Isolated instances may indicate bad faith, but it's the *over-all conduct* of the negotiations that counts.

The NLRB said the following conduct was permissible (overruling the trial examiner, who had previously ruled otherwise):

1. Union Carbide refused to improve pensions and turned down an alternative proposal for later reopening. Legal, said the Board, since the refusals were based on economic considerations discussed with the union.

2. Union Carbide said it would re-open on wages—but not pension or employee benefits. Trial examiner said this was inconsistent. Not so, found the Board,

SPECIAL ELECTRICAL ALLOYS

CORROSION and HEAT-RESISTANT STEELS

TOOL and DIE STEELS

*Coming at you —*

## One of the Royal Family of Steel

Our niche in the economic health of this nation in peace, and its defense in war, is to develop and produce the high-alloy steels and other special alloys which will do what ordinary metals cannot even approach in resisting corrosion, heat and wear, and in performing vital electrical and electronic chores. Whenever you have problems in these fields, the place to come is **Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.**

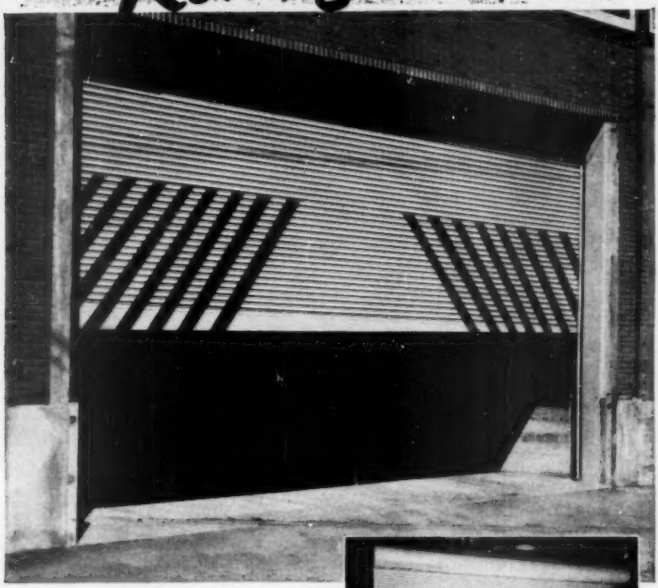
**PIONEER in Specialloy Steels**

# Allegheny Ludlum

AL
TIME-TESTED STAINLESS STEEL

W&D 4092 B

KINNEAR
Rolling Doors



Greater Efficiency
SAVES
Time, Space, and Money

*Every Kinnear Door* is tailored to fit the individual opening, in old or new buildings. Coiling neatly above the lintel, they open straight up — can't interfere with traffic or other plant activity. A half-century of use under the most difficult conditions gives complete proof of the Kinnear Door's capacity for years of hard, constant service.

*They save money* because their rugged, all-steel, interlocking slat curtain assures long life and low maintenance costs, plus *extra* protection against fire, intrusion, or wind damage. Slat surfaces are heavily zinc coated by the hot-dip process, and a special Kinnear Paint Bond is applied to assure lasting paint adhesion.

*They save space* by opening straight up and coiling above the doorway, allowing all floor and wall space around the door to be used at all times.

*They save time* with their smooth, easy, gliding action. With motor operation, doors can be fully and safely controlled by push-buttons from any number of convenient locations.

*Write for your copy of new catalog.*

**The KINNEAR Manufacturing Company**

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*Saving Ways in Doorways*
KINNEAR
ROLLING DOORS

# PRACTICAL LABOR RELATIONS

*Begins on page 210*

calling it one of the inconsistencies of bargaining. Since employee benefits require long-range planning, the varying position is justified.

3. Union Carbide reminded the union during negotiations that it didn't have to grant union demands. OK, said the Board. It didn't have to, according to law.

4. Union Carbide put the union's employee benefit demands into effect a year after it had rejected them. OK! Economic conditions had changed.

## Are You the Sole Judge of a Fair Day's Work?

Your contract with the union may say you are the only judge of the quality of work required of your employees. But this does not necessarily mean you can fire workers at will when they don't meet production standards. One arbitrator, at least, feels that the way you handle the case is an important element. For example:

The RPM Manufacturing Co., Lamar, Mo., set up production standards without taking them up with the union. Then it fired a worker who didn't meet the standards. The union argued:

- You can't make an employee meet requirements never announced.
- Discharge was too severe a penalty, particularly since the deficient worker had not received any warning.

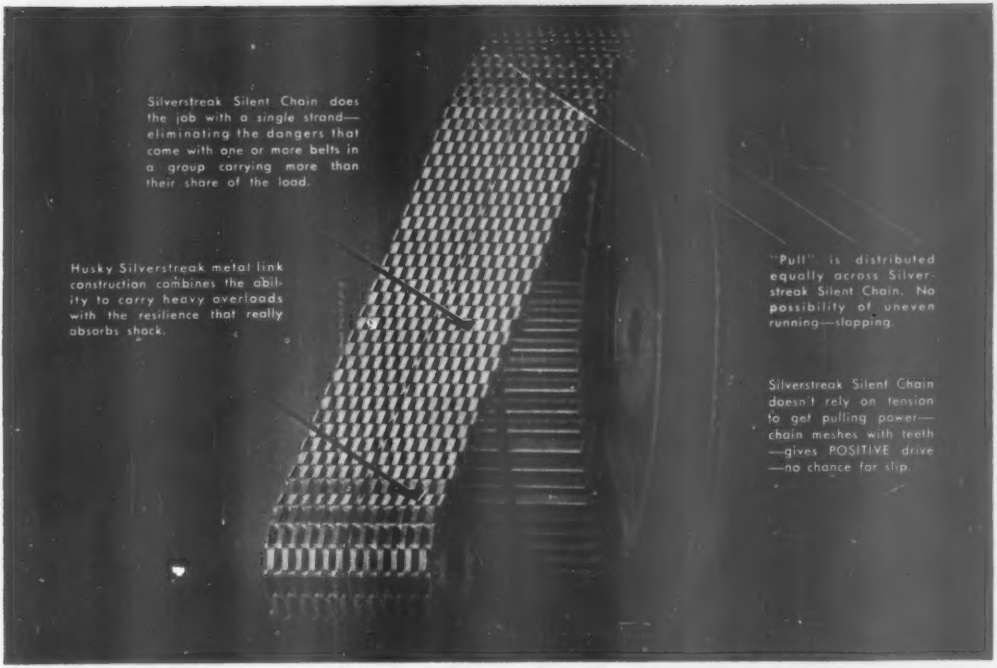
An arbitrator ruled:

Under this particular contract the company had the right to set standards, subject to challenge via the grievance machinery.

The employer had failed to set up a system for warning employees of deficiencies, and had failed to announce the new system.

Discipline was OK. But, since

# Here's the proved way to transmit high hp at high speeds...


Silverstreak Silent Chain does the job with a single strand—eliminating the dangers that come with one or more belts in a group carrying more than their share of the load.
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"Pull" is distributed equally across Silverstreak Silent Chain. No possibility of uneven running—slapping.
Silverstreak Silent Chain doesn't rely on tension to get pulling power—chain meshes with teeth—gives POSITIVE drive—no chance for slip.

## Link-Belt Silverstreak Silent Chain drives are slip-proof...slap-proof...shock-proof

ON thousands of applications . . . under all types of operating conditions—Link-Belt Silverstreak Silent Chain Drives have proved their effectiveness and durability. High horsepowers and high speeds are delivered with the same trouble-free efficiency (over 98 per cent) as on less demanding loads. There's a power-transmission engineer in the Link-Belt office near you.

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**SILVERSTREAK SILENT CHAIN DRIVES**

12,820

**LINK-BELT COMPANY:** Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices, Factory Branch Stores and Distributors in Principal Cities.

As it has since 1940, a touch of the control button brings exact press speeds at the New York Herald Tribune. In those 12 years, there has been no replacement required on the two 100 hp Silverstreak Silent Chain Drives that power this press at chain speeds up to 3664 fpm.

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*Ramset Fasteners*, INC.

Ramset Division, Olin Industries, Inc. • 12117 BEREA ROAD • CLEVELAND 11, OHIO

# PRACTICAL LABOR RELATIONS

*Begins on page 210*

the employee had not been warned, discharge was too great a penalty. *(RPM award)*

## Test of Long-Term Pension Contracts Coming

How good is a 5-year pension contract? It may not be long before we find out. The United Auto Workers Union has hit General Motors for a boost in pension benefits to restore the purchasing power of retired employees to what it was in 1950 (when the plan was negotiated). Unless both parties consent, the plan cannot be re-opened until 1955.

The UAW also plans to ask Ford and Chrysler to re-open their 5-year pension plans. The reason: The contract "must remain a living document giving recognition to the changing scene of American economy."

## Interstate Employers Not Free of State Labor Law

Employees whose business is interstate may feel that their labor relations are covered by the Taft-Hartley Act — not state law. This may be true generally, but it isn't when it comes to union security.

The closed shop is out—because it is banned by federal laws.

The union shop and maintenance of membership are out in 13 states—even though the employer engages in interstate commerce, and even though such forms of union security are OK under federal law.

The states which ban all forms of union-security clauses are: Arizona, Arkansas, Florida, Georgia, Iowa, Nebraska, Nevada, North Carolina, North Dakota, South Dakota, Tennesee, Texas, and Virginia.

*Turn the page*

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Lev-R-Matic DRIVE

FORK LIFT TRUCKS

*for Low Cost Handling!*

**Stand-up & Sit-down Models**

**2,000, 2,500, 3,000, 3,500 capacities on 15" load center. • 63", 72", 83" Masts. Special Masts to Order.**

**WRITE *for Complete Specifications***

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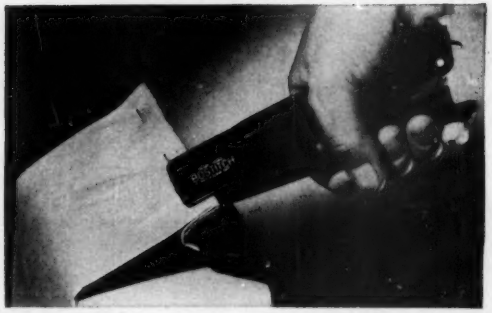
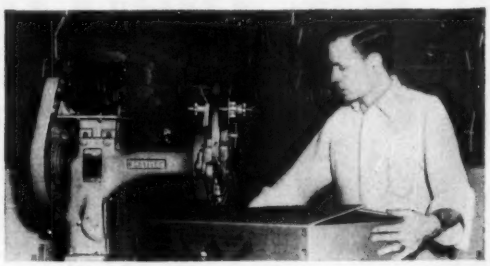


**ICE IN THE BAG.** Yes, you can buy ice in sturdy paper bags. The bags, in this case, were once closed with twists of wire. But the local Bostitch economy man showed the ice manufacturer how much better looking, stronger, and more salable staple-sealed bags are. Now all ice plants in the chain use Bostitch stapling pliers to close ice bags.

## BAGGING ICE... OR BOXING A FOREST...

## BOSTITCH DOES IT BETTER AND FASTER!

**YOUR CHRISTMAS TREE** arrives in a big corrugated container when you order it from this famous Northwest packer. The bottoms of the boxes are closed with a Bostitch wire stitcher. The Bostitch method saves packing time, cuts material costs, eliminates losses due to moisture-loosened seals. Boxes can be made up as needed —no storage problem. Bostitch could save time and money in *your* shipping room, too.



**FREE BULLETIN** *describes 30 of the 800 Bostitch models most often used for wrapping, packing and container closing. Send coupon.*

**THERE'S A BOSTITCH MAN NEAR YOU**—*100 fieldmen in 123 cities in the U. S. and Canada. Bostitch service is always nearby.*

**BOSTITCH**
611 Mechanic Street, Westerly, R. I.

Please send me a free copy of your bulletin on Bostitch stapling machines for shipping-room use.

I am particularly interested in a better and faster method for:

☐ Assembling cartons ☐ Repairing cartons for re-use
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Other _____

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*Company* _____
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fastens it better, AND FASTER with wire

ALL TYPES OF MACHINES FOR APPLYING STAPLES
ALL TYPES OF STAPLES APPLIED BY MACHINES


# PRACTICAL LABOR RELATIONS

*Begins on page 210*

## BRIEF BUT IMPORTANT

**A company reorganized under the Bankruptcy Act must take over the pension plan** of its predecessor if the plan was incorporated in a union contract, according to a federal district court ruling. (*American Railroad*)

► **The Labor-Management Relations Act** does not permit a group of employers to lock out their non-striking employees in order to counteract a strike at the plant of one employer of the group.

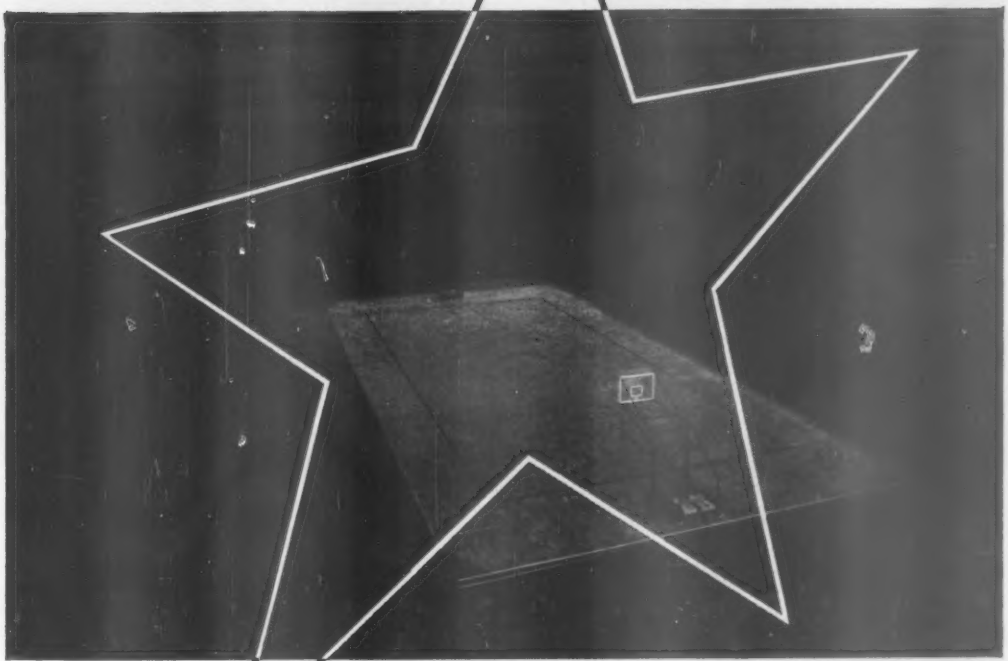
► **A business agent** in a New Jersey teamsters' union is put away for two years under the long-dormant federal Anti-Racketeering Act. The agent had asked a non-union driver to take on a union helper at $10 per day. Violence followed.

► **The new 1953 W-2 income tax withholding forms** have been issued by the Treasury Department. As before, you can print these forms yourself—and no prior approval of the Bureau of Internal Revenue is needed. But you must follow the rules for reproduction. Ask the Bureau for IR-Mimeo 34, 9-11-52.

► **Employees will be reimbursed** by the company for damaged personal clothing under a contract signed by DuPont and the International Chemical Workers (AFL).

► **Over 2000 companies** are being investigated for violations of pay controls, the Salary Stabilization Board reported recently.

# SPANG® CW is a star performer



## in the University of Detroit's new Memorial Building

Built to provide facilities for sports, plays, lectures and other important campus activities, the University of Detroit's new Memorial Building is the last word in modern, up-to-date planning.

With a seating capacity of 11,000, this completely air conditioned, two and one-half million dollar structure is a major investment. Therefore, it was built with only the best materials . . . carefully planned to give long-time service, free from maintenance problems.

For instance, wherever pipe was needed—for plumbing, heating and air conditioning—reliable Spang CW Steel Pipe was installed 100%.

And there was a good reason. Spang CW is *the quality-controlled* pipe. Constantly inspected through every step of manufacture and carefully controlled during forming, Spang CW always gives complete dependability and freedom from trouble.

Which explains why Spang Steel Pipe has just the right characteristics to give easy threading, bending and cutting . . . features that speed installation time and reduce costs.

So don't just ask for pipe. Specify *better* Spang CW Steel Pipe from your local Spang distributor.

*Owner:* University of Detroit
*Architect:* Harley, Ellington & Day, Inc., Detroit, Michigan
*General Contractor:* W. E. Wood Company, Detroit, Michigan
*Piping Contractor:* Harrigan & Reid Company, Detroit, Michigan

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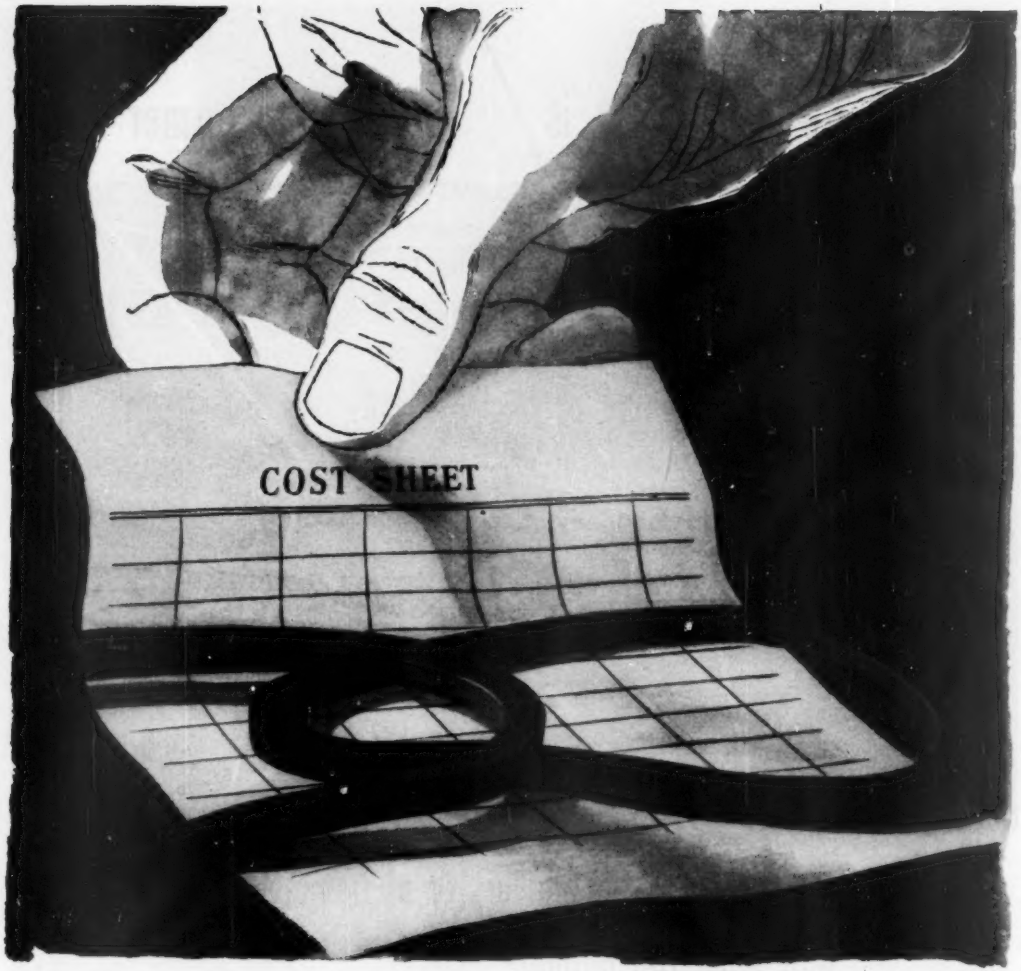


# Why U. S. Rubber V-belts *cut overhead*

**Savings in Maintenance:** Inherent stretch is worked out mechanically in the factory; take-up is seldom, if ever, necessary. If required, the belt can be made oil-proof.

**Savings in Power:** Because U.S. Rainbow V-belts have practically no slippage, there is no loss of power between driver and driven machines.

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To reduce any heat generated by constant flexing, and to get maximum adhesion between the component parts of the belt, the cords are treated with latex. Every U.S. Rainbow belt has the unique Equa-Tensil Cord Section—the U.S. Rubber development that insures sufficient pull and strength under diverse operations. Order from your jobber, or for more information, write to address below.

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# this wrench

# can slash your costs 3 ways

## *TAC Open End Ratchet Wrench*

**delivers incredible savings wherever "tight" situations prevail involving tubing, pipe, conduit, cable or long studs. Saves at least three ways:**

1. **CUTS TIME** on production or maintenance operations because it slips around tubing and down fittings, where you ratchet off or on in mere seconds. Functions perfectly with as little as 7° arc clearance for handle. Reduces workman injury too—TAC can't slip off the work and skin up knuckles.
2. **CUTS COST** on fittings, tubing, etc. Snugs down on fittings, never "barks" or scars the hex fitting.
3. **REDUCES INVENTORY OF HAND TOOLS** required in your tool crib. Several sockets, a few head sizes, and you eliminate over *half* the wrenches you'd otherwise maintain.

### "BORROW" ONE— PROVE FOR YOURSELF!

Rated companies may request on Letterhead a sample handle, head and socket, for full trial. We ship on memo billing—returnable for full credit. ACT NOW—"BORROW" THIS MIRACLE WRENCH and prove its value!

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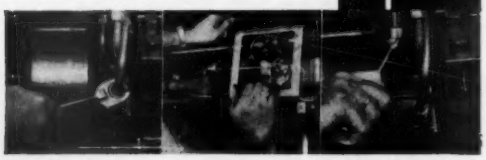

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*saves 2 ways...* { LESS MAN-HOURS / LESS MACHINE-HOURS

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## either... SIMULTANEOUSLY or... INDEPENDENTLY

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Eight-ton crawler and 12½-ton truck-mounted models also available. Write for specifications and prices. You'll like both.

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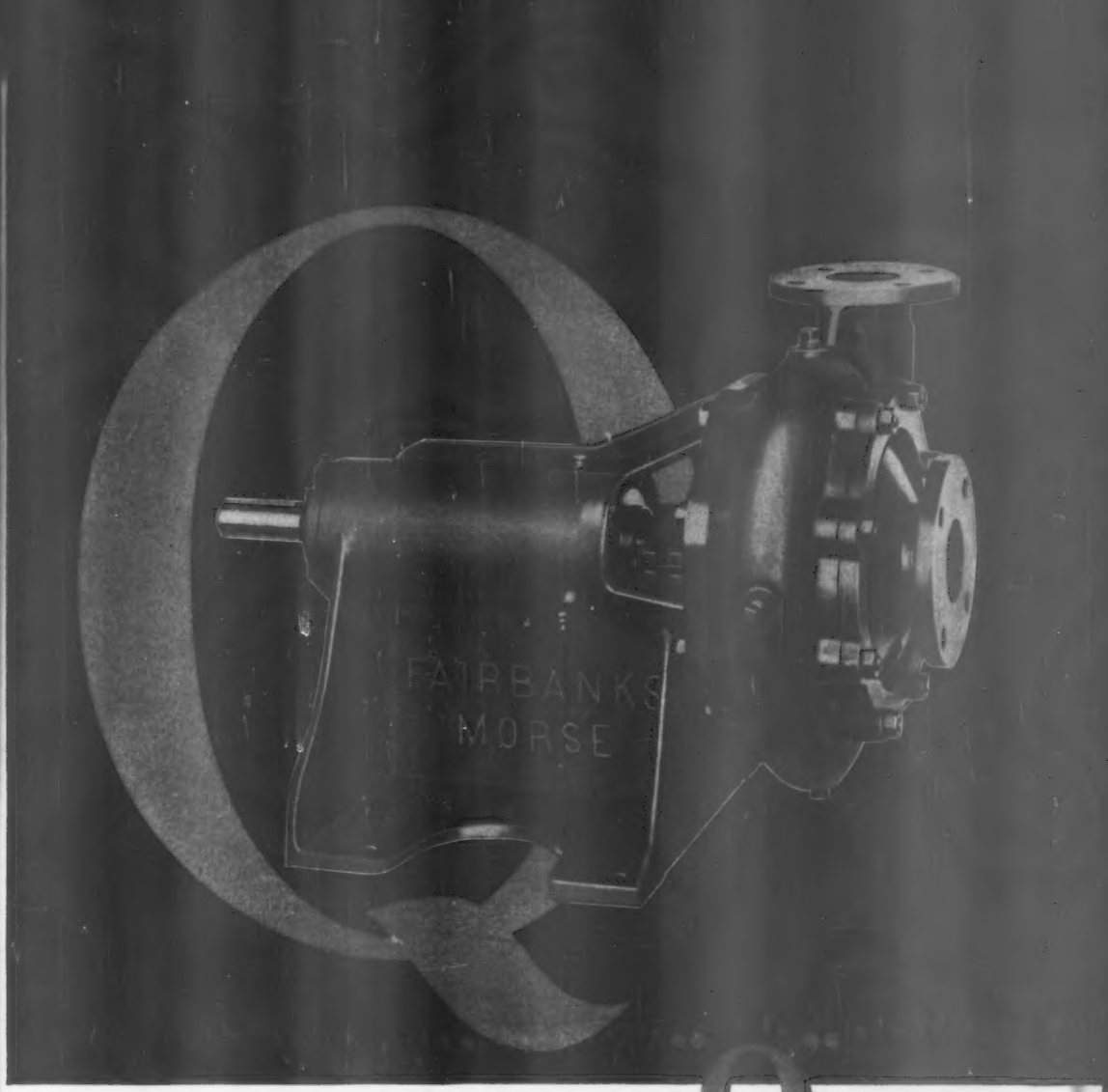
DEPT. F, FORT WAYNE, INDIANA




# it's Your Q

**Quality** . . . that costs no more is yours when you choose Fairbanks-Morse Side Suction Centrifugal Pumps. Extensive engineering laboratories . . . production line methods with precision machining of all parts enable Fairbanks-Morse to offer you a side suction centrifugal with the design, workmanship and performance normally obtained only in highest quality split-case pumps.

Open type, single suction, high efficiency impeller . . . ball-bearing frame construction for long life and smooth operation . . . one-piece, solid cast frame . . . close-grained smooth cast iron volute . . . are among the many big pump features you'll find in these moderate priced side suction centrifugals.

For a "cue" to better pump performance, choose the pumps that spell quality with a capital "Q" . . . Fairbanks-Morse Side Suction Centrifugals. Fairbanks, Morse & Co., 600 S. Michigan, Chicago 5, Ill.

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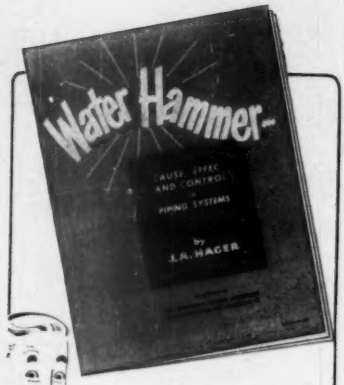


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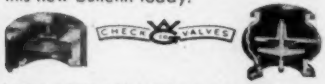
This important new Bulletin WH-851 explains in detail the causes and damaging effects of costly Water Hammer—and how it can easily be controlled with Williams-Hager Silent Check Valves. Learn how Water Hammer can be quickly and inexpensively controlled *in your piping system*—send for your copy of this new bulletin today.

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F-1252


Leadership test:

# How a Canny Scot Proved Its Value

**MEMO**

TO The Editor, FACTORY

FROM C. D. Mackinnon,
Airdrie,
Lanarkshire, Scotland

SUBJECT "How Good a Leader Are You?" by Auren Uris*

Mr. Uris's article and the accompanying leadership test attracted considerable attention here in industrial Lanarkshire.

To stimulate interest--with, perhaps, a propaganda undertone--I took the opportunity of running the test as described below. It was enthusiastically received by the "supers" concerned, and I am wondering if the experience is of interest to you.

C. D. Mackinnon

**You bet it's of interest to us. And we think FACTORY's readers will be interested, too, in how Mr. Mackinnon applied the article and test to his plan. So here's his report:**

FIVE SHOP SUPERINTENDENTS, [wrote Mr. Mackinnon] all of whom had received some leadership training, were selected to take the test. Here, we thought was a useful way to assess the practical value of their training.

We gave the test twice—once before and once after the men had read the views expressed by Mr. Uris. But during the first testing we avoided any hint that a second testing would follow. The only guidance was an interpretation of "Democratic," "Autocratic," and "Free-Rein" leadership—the basic terms used in the test. Mr. Uris's answers were not revealed until after the second testing.

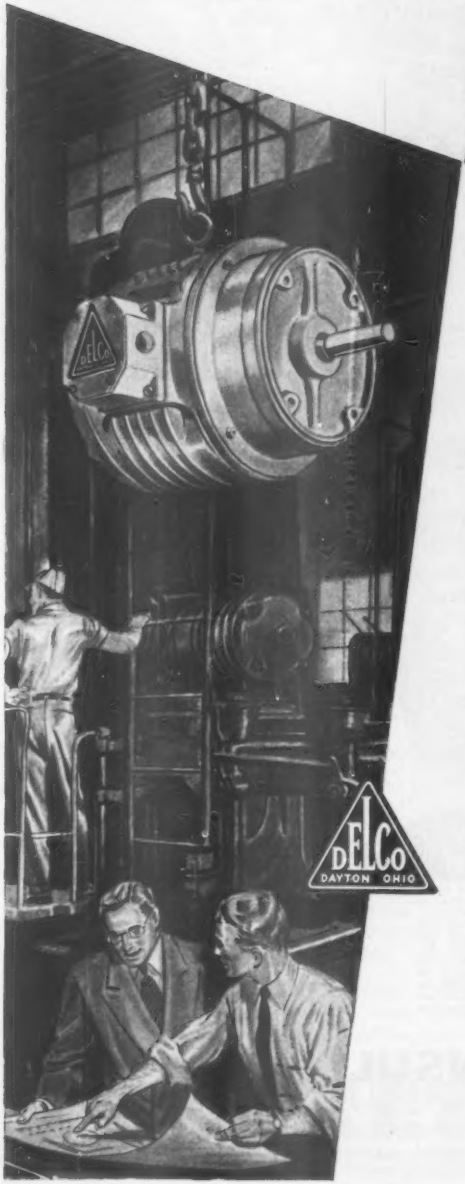
Results (first and second scores listed in order and based on a possible 80) were as follows:

Superintendent of general engineering production, 40, 45; superintendent of fitting and assembly, 55, 55; toolroom superintendent, 30, 55; superintendent of sub-assemblies, 45, 50; welding superintendent, 55, 65.

*Continued on page 228*

*FACTORY, July 1951; reprinted in *The Machinst* of London, May 10, 1952. This was the first in a series of four articles on leadership by Mr. Uris, editor, Research Institute of America, Inc. Each article included a leadership test.

*Those in the know...*




**replace with**

# DELCO MOTORS

When motor replacements are needed—fast—it's a great satisfaction to be able to *reach for a name.* A name like *Delco.*

Those who know their integral motors—master mechanics, electrical engineers, plant engineers—know that the name *Delco* identifies integral motors that *exceed* industry standards in matters of performance, dependability and long life.

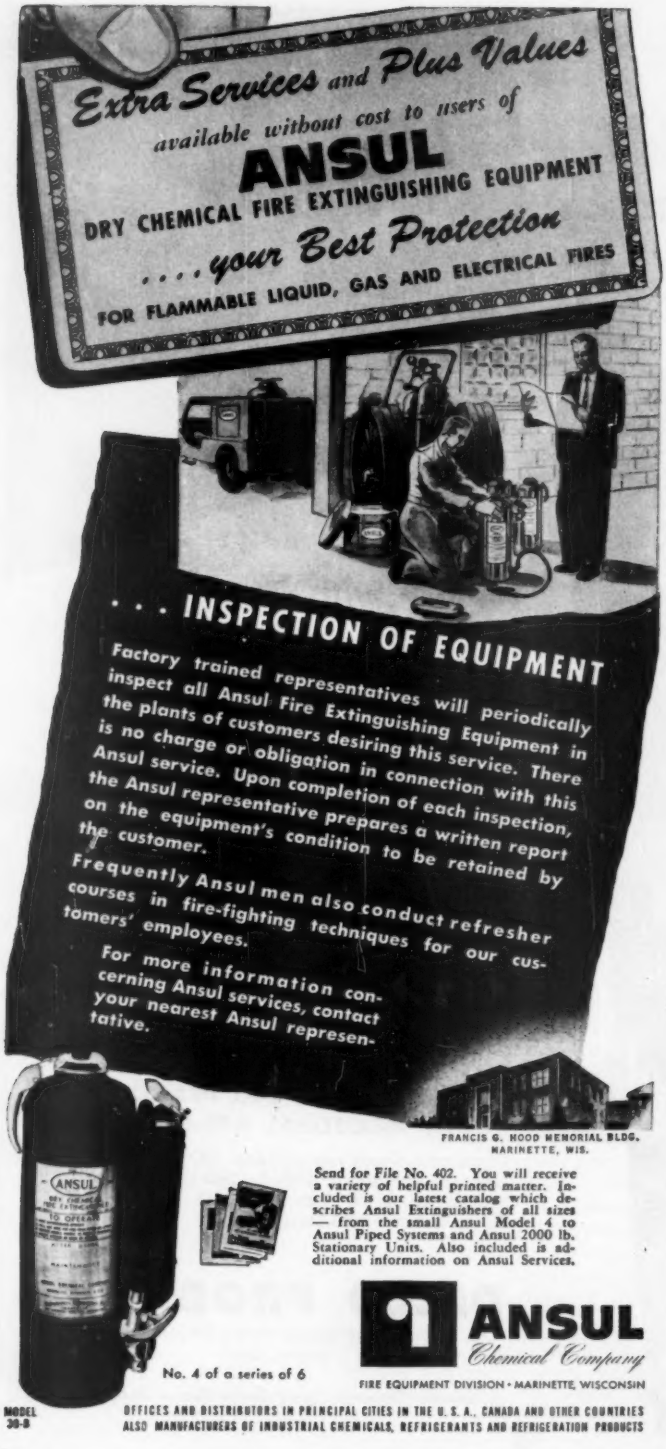
## THERE'S A DELCO FOR PRACTICALLY ANY INDUSTRIAL APPLICATION

Open and closed motors up to 100 h.p. for standard foot mountings. NEMA C&D flange-mounted motors up to 30 h.p. Available through local Delco motors distributors.

## DELCO PRODUCTS

**Division of General Motors Corporation**
**Dayton, Ohio**

**Available Through Local Delco Motor Distributors**


Extra Services and Plus Values
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DRY CHEMICAL FIRE EXTINGUISHING EQUIPMENT
. . . . your Best Protection
FOR FLAMMABLE LIQUID, GAS AND ELECTRICAL FIRES
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Factory trained representatives will periodically inspect all Ansul Fire Extinguishing Equipment in the plants of customers desiring this service. There is no charge or obligation in connection with this Ansul service. Upon completion of each inspection, the Ansul representative prepares a written report on the equipment's condition to be retained by the customer.
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Send for File No. 402. You will receive a variety of helpful printed matter. Included is our latest catalog which describes Ansul Extinguishers of all sizes — from the small Ansul Model 4 to Ansul Piped Systems and Ansul 2000 lb. Stationary Units. Also included is additional information on Ansul Services.
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ALSO MANUFACTURERS OF INDUSTRIAL CHEMICALS, REFRIGERANTS AND REFRIGERATION PRODUCTS


## LEADERSHIP TEST

*Begins on page 226*

### Tests alone didn't prove much . . .

It was apparent that reading the article did not greatly alter scores made on the same batch of questions. Four of the superintendents improved, it is true. But, with one exception, the scores showed no startling change.

The exception, the toolroom superintendent, was quite in line with circumstances. He is still in his twenties, and, although academically a topnotcher, has something to learn about human relations on the shop floor.

After reading your contributor's reasoning, he seems to have decided that a drastic revision of his own ideas was called for. I lightly questioned him on his change of heart, making playful reference to "pot hunting." He earnestly assured me that your contributor's logic left him no option.

Ingeniously ignoring the possibility of himself being sometimes dull on the uptake, he suggested a black mark against our elementary leadership training.

The other four "supers" are mature executives, as their test results show. The welding superintendent, a regular old-timer with fixed, definite ideas, was a real surprise. When twitted with having adopted your contributor's views to help his score, he would only comment: "They are *my* views now."

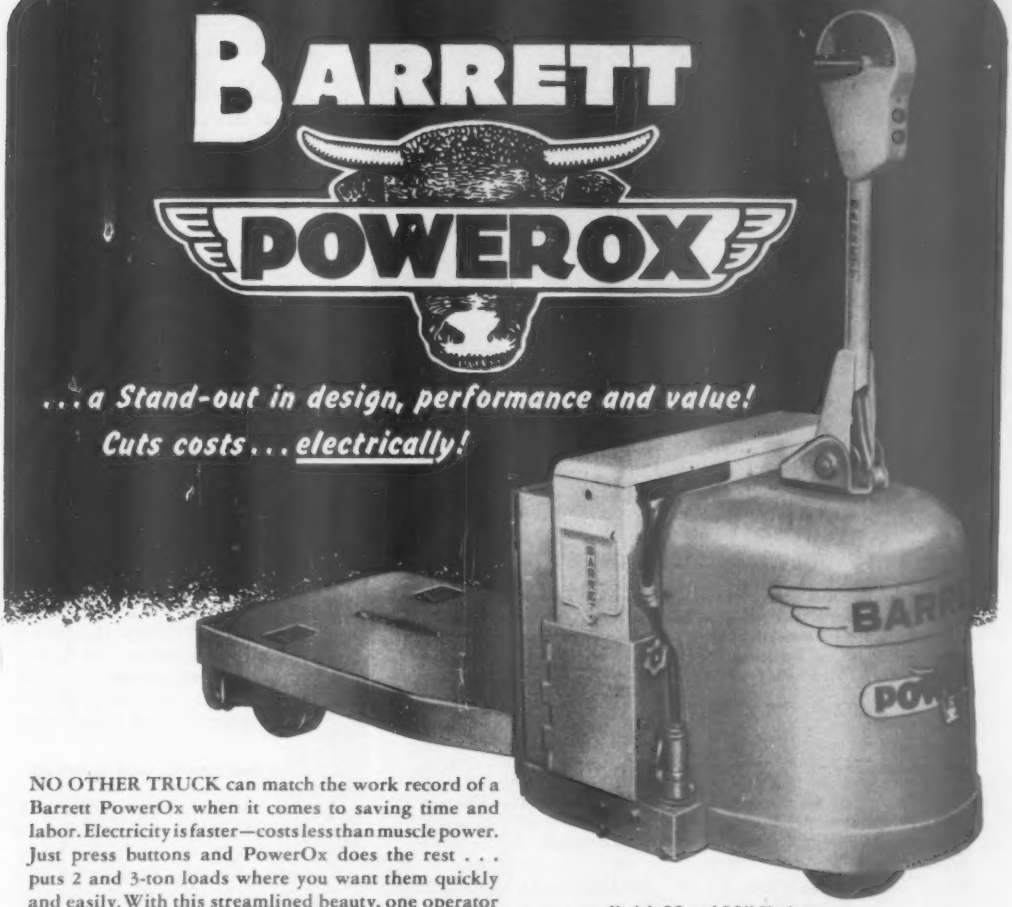
### . . . but interest was kindled

Our experiment stimulated discussion among superintendents and managers in a large group of associated works. It proved to be a burning topic at meetings, dinners, canteen gatherings, and even at a wedding presentation—this latter in leg-pull dress, of course, but still an indication of the interest and speculation aroused by a challenging topic.

# BARRETT POWEROX

*...a Stand-out in design, performance and value!*

*Cuts costs... electrically!*



NO OTHER TRUCK can match the work record of a Barrett PowerOx when it comes to saving time and labor. Electricity is faster—costs less than muscle power. Just press buttons and PowerOx does the rest . . . puts 2 and 3-ton loads where you want them quickly and easily. With this streamlined beauty, one operator does more than 3 or 4 using less efficient methods.

## SEE WHAT POWEROX GIVES YOU!

Electric drive—travels at walking speeds . . . Electric push-button lift—4 inches in 4 seconds . . . High frame clearance—no snagging on ramps or uneven floors . . . Easy steering—through 270 degrees for narrow, cramped aisles.

***Write for PowerOx Bulletin 4861. Also Catalog Describing the Complete Barrett Line of Money-saving Materials Handling Equipment***

**Models PO and POK Platform PowerOx** . . . here is the easiest maintenance you ever saw. Designed with the maintenance man in mind. Walkie type for skid handling. Also the *Pallet Ox* for pallets. 4000 lb. capacity

**Model TX Tractor Ox.** Designed for towing and pulling. Maneuverable in tight quarters. Has 700 lb. drawbar. 20,000 lb. rolling capacity.

**Model TTF20 PowerOx** telescopic tilting fork truck. Indispensable where palletized loads are used. Ideal for overhead storage. 2000 to 3000 lb. capacities. Lift—10'.

**BARRETT-CRAVENS COMPANY**
4629 S. Western Blvd., Chicago 9, Illinois
*Representatives in All Principal Cities*
Canadian Licensee: S. A. Armstrong, Ltd., Toronto, Canada

Barrett Handling Equipment

**BARRETT**

**ONE MAN DOES MORE THAN 3 OR 4 . . . WITH A BARRETT**

**Here was a real finishing problem!**

**Run an abrasive belt** over a right-angle stationary guide at 4000 feet per minute . . . smooth and polish a small, recessed area on thousands of precision-made automatic pistol stocks . . . *and still eliminate excessive belt breakage!* This was an actual problem that confronted one prominent manufacturer. Here's how Jewel Brand Abrasive Engineers helped solve it.

**A small sample** of scrap abrasive belting was picked at random from the plant waste barrel. This was carefully analyzed by experienced Jewel Brand Engineers. It was fully tested in terms of the type of product being finished and the material used. Then, basing their selection on the findings of the "Waste Barrel" Test combined with basic information on the job requirements, these same qualified engineers recommended a Jewel Brand Abrasive Belt that has not only eliminated excessive belt breakage but one that has consistently done a better job, faster and *at a lower cost.*

**This is only one of many** difficult finishing problems quickly and effectively solved by Jewel Brand Engineers. It could just as well be *your* problem . . . your plant . . . your savings! So whatever your finishing operation may be we urge you to make the easy, profitable "Waste Barrel" Test now. Simply cut out a letter-size sample of used abrasive belt . . . include the belt joint, if possible . . . and send together with completed coupon. We'll do the rest *at no obligation to you.*

**ABRASIVE PRODUCTS, INC.**
**519 Pearl Street**
**South Braintree 85, Mass.**

*HELP me complete the Waste Barrel Test!*
*Enclosed is a sample of used belt from our plant.*

NAME _____ POSITION _____

COMPANY _____

ADDRESS _____

TYPE OF PRODUCTS _____ MATERIAL _____

WE USE APPROXIMATELY _____ BELTS PER MONTH _____

BELT LENGTH _____ BELT WIDTH _____


## LEADERSHIP TEST

*Begins on page 226*

Several discussion groups surveyed and analyzed what we styled the article's "instructional elements"—"The Three Ways to Lead—and When to Use Them," "The Successful Leader in Action," and "How Flexible a Leader Are You?"

As was to be expected, responsible executives here in Scotland differed with your contributor on several points. They also differed among themselves. But they agreed unanimously with your contributor's dictum: "There's no *one* best way to lead."

It was evident that most of the executives — without delving deeply into technicalities — had evolved their own philosophy on how to lead. Their general opinion was that some operators react favorably to a pat on the back; others improve on a little thinly veiled flattery; some can openly and unashamedly swallow flattery by the bucketful—and work the better for it; some benefit from a metaphorical kick in the pants.

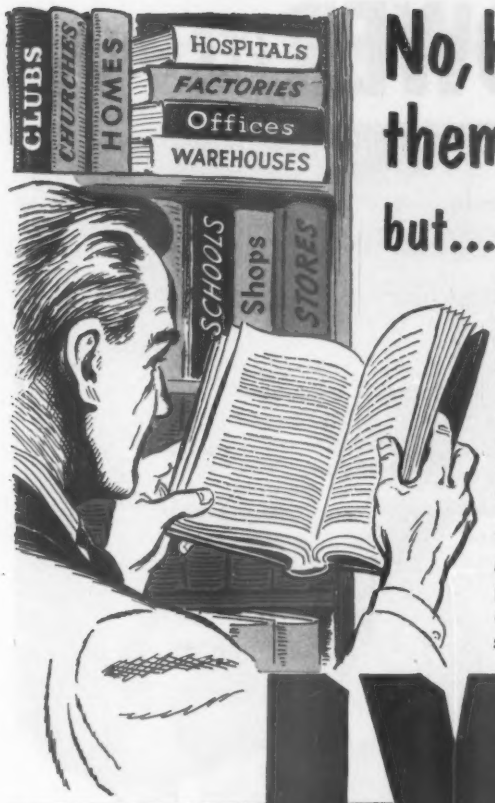
### . . . and action was sparked

It was obvious that each executive, in his own way, was working along lines similar to those suggested by your contributor. But their approach was piecemeal and by instinct instead of as a team with a definite plan.

Also, they appeared to be applying their experience to obvious cases only. They were not studying each individual operator to produce the best results in output and job contentment.

Among the operators there seemed to be quite a percentage whom the executives dismissed as "hopeless cases." As a consequence of FACTORY's challenging and comprehensive article, we have set about transforming those hopeless cases into hopeful cases.

It is too early to announce definite results, but the initial approach is not altogether discouraging.




# No, he doesn't know them all like a book...

**but...** there's one phase of virtually every business which Lyon Steel Equipment Dealers know "from cover to cover." That phase has to do with helping their customers make the most out of steel equipment in terms of savings in time, labor and money.

A highly diversified line of more than 1500 standard Lyon items enables Lyon Dealers to meet the varying needs of business, industry and institutions—*better*. A very few typical products are shown below.

*Lyon also has facilities for special contract work.*

FACTORIES IN ... AURORA, ILL., AND YORK, PA.

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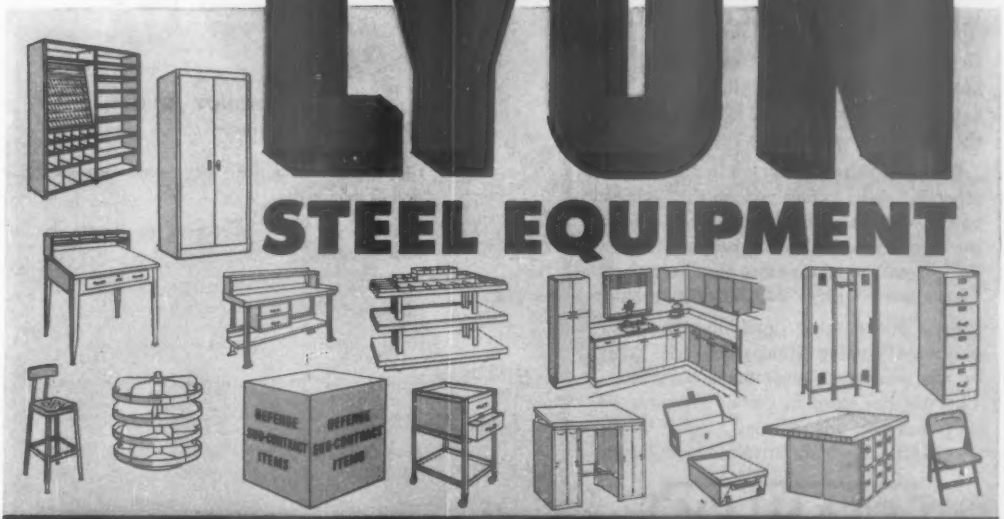
General Offices: 1212 Monroe Avenue, Aurora, Illinois

*Sold Nationally Through Dealers and Branch Offices*

# LYON

## STEEL EQUIPMENT




**A PARTIAL LIST OF LYON STANDARD PRODUCTS**

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| • Lockers | • Cabinet Benches | • Bar Racks | • New Freedom Kitchens | • Flat Drawer Files | • Folding Chairs | • Sorting Files | • Shop Boxes |
| • Stools | • Storage Cabinets | • Tool Boxes | • Toolroom Equipment | • Revolving Bins | • Work Benches | • Drawer Units | • Tool Trays |
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# PACKS MORE POWER PER POUND

NEW Stanley

Shown actual size

# "MIGHTY MIDGET"

**¼" Heavy-Duty ELECTRIC DRILL**

Here is a fresh fist-full of power built for heavy-duty production drilling. It's the lightest, the most powerful ¼" drill ever . . . the new Stanley "MIGHTY MIDGET".

Compare this "MIGHTY MIDGET" with other ¼" drills before you buy . . . check point for point on the features you get for the money you pay. And remember you pay no "extras" for all the extra features offered by the new Stanley "MIGHTY MIDGET".

Send for catalog describing this and other cost-cutting Stanley Electric Tools or ask your distributor for a demonstration. He has them in stock . . . ready to go to work for you. Stanley Electric Tools, 407 Myrtle St., New Britain, Connecticut.

STANLEY

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## COMPARE

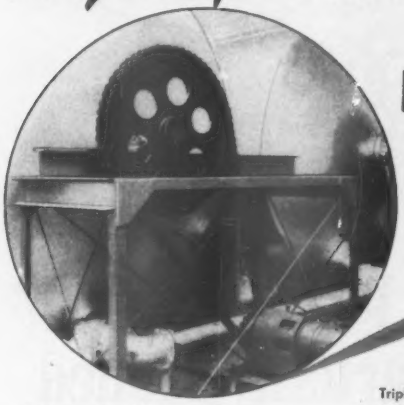
*—only the Stanley "MIGHTY MIDGET" offers all these features—*

- Lightweight — only 3⅛ lbs. — most powerful drill of its size.
- Compact — 7⅛" long — easy to handle in close quarters.
- Balanced design — trigger-grip handle with auto-safety lock.
- Highly polished die-cast aluminum housing.
- Seal-type ball bearings, helical alloy steel gears.
- Removable chuck guard for better control, extra.
- Models in 6 different speeds — 5000, 3500, 2500, 2000, 1000, and 600 r.p.m.
- 3-jaw geared chuck, threaded in spindle.
- Brushes fully enclosed — protected from dirt and misuse.

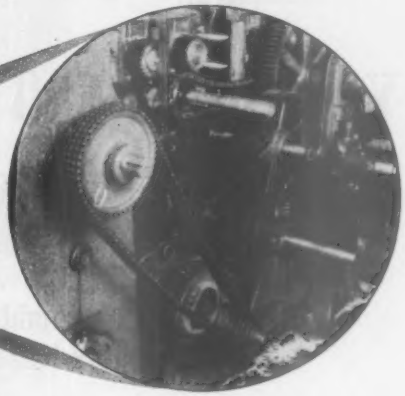
**HARDWARE • TOOLS • ELECTRIC TOOLS • STEEL STRAPPING • STEEL**

*In your plant, too*

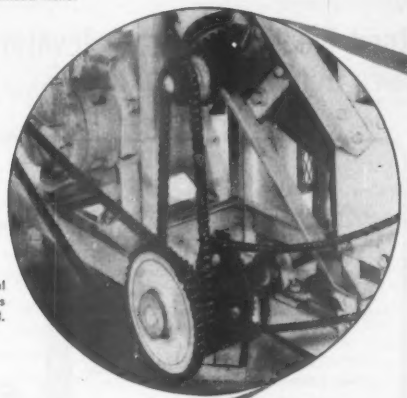
# there are many jobs DIAMOND ROLLER CHAINS can do most effectively



Agitator drive 5-ft. center distances. Exact slow speed of agitator assured. (Guard removed to show No. 478 Diamond Roller Chain).



Triple strand chain from motor with another shaft to shaft drive above.



Power source to several shafts at speeds selected as required.

Plant drive in wire mill—driven shaft above is rotated in opposite direction to driving shaft (below).

• For high speed drives from motors, drives from shaft to shaft or one shaft to several others, Diamond Roller Chains provide ideal operation. They are non-slipping, highly efficient (98-99%) and insure reliable top output for many, many years of service.

You will find many applications in your plant where Diamond Roller Chains can serve you. Catalog 709 gives basic chain and sprocket data—copy on request.

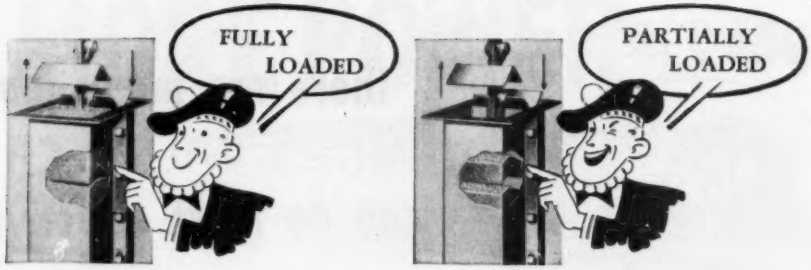
**DIAMOND CHAIN COMPANY, Inc.**
*Where High Quality Is Tradition*
**Dept. 449, 402 Kentucky Avenue**
**Indianapolis 7, Indiana**
*Offices and Distributors in All Principal Cities*

*Refer to the classified section of your local telephone directory under the heading CHAINS or CHAINS-ROLLER*

***Shot-Peening Since 1944***

As a matter of course recognizing the value of forging action for increasing strength of steel without adding weight, Diamond long ago experimented with shot-peening. The first of a battery of production shot-peening machines was installed in 1944.

DIAMOND ROLLER CHAINS




# Yes—BULK-FLO gives positive, gentle handling—fully or partially loaded

## LINK-BELT's combined feeder-conveyor-elevator profitably handles hundreds of materials

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YES, only BULK-FLO gives you all these advantages in a single unit . . .

1. *Positive movement* of material. Solid flights substantially cover area of casing—no avalanching on vertical or steeply inclined runs.
2. *Gentler handling.* Material is protected in individual "compartments" for minimum degradation.
3. *Self-clearing.* To permit alternate handling of different materials and to prevent contamination of batches.
4. *With constant speed,* capacity can be varied by regulating feed.
5. *No contamination* from lubrication.
6. *Chains and casings* can be metal-coated or made of alloy. Dust-tight. Can also be liquid- and vapor-tight.
7. *Horizontal, inclined, vertical* or a combination of these paths in a single unit—often requiring less units, in less space, at lower cost.

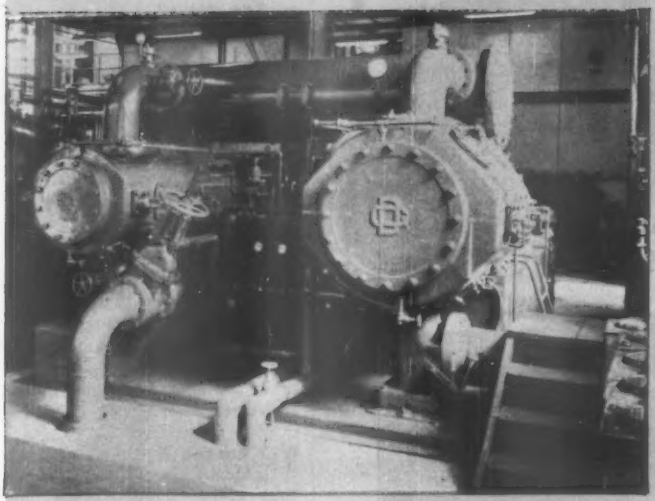
Ask your Link-Belt representative for further information. Or write for your copy of Book 2175.

Choose from these five BULK-FLO designs: (1) Combined-run L-path. (2) Loop-loading vertical path. (3) Separated-run L-path. (4) Separated-run horizontal. (5) Combined-run horizontal.
Single or multiple inlet openings can be obtained on all Bulk-Flo units except (2).
Single or multiple discharge openings can be had with all units.
Front or side discharge can be obtained with any vertical head sections.
1
2
3
4
5

**LINK-BELT**

**BULK-FLO**
**FEEDERS - CONVEYORS - ELEVATORS**

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices in Principal Cities.



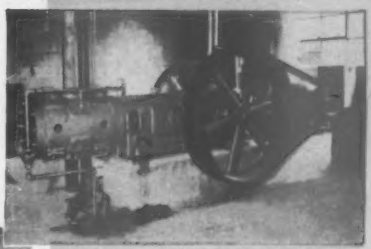
# Pin Money Maintenance!

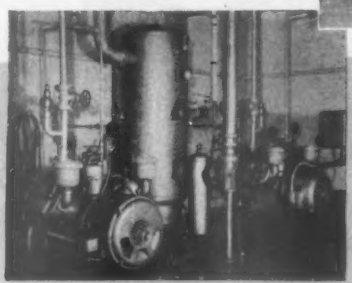
That's all it takes to keep a Gardner-Denver HA Compressor puffing away at top efficiency. One HA, for example, has been handling the full air load in a southern foundry and manufacturing plant for eight years—and has required only $10.00 for maintenance. That's $1.25 a year!

How come? A look at the soundly built power end and the reliable lubricating system will give you some of the answers.

And how about operating costs? They're unusually low, too—thanks to Gardner-Denver correctly designed air cylinders and low-lift "Air Cushioned" valves.

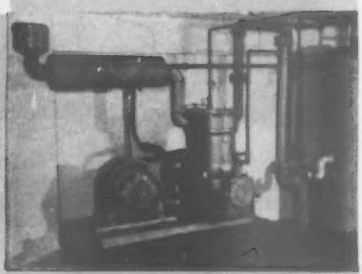
Another dependable compressor —the Gardner-Denver RX.





Space-saving efficiency—with Gardner-Denver WB Compressors.

**For low-cost compressed air in any volume—choose Gardner-Denver Compressors. Write today for full details.**



For continuous service— Gardner-Denver AA Compressors.

SINCE 1859

## GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois
*In Canada:*
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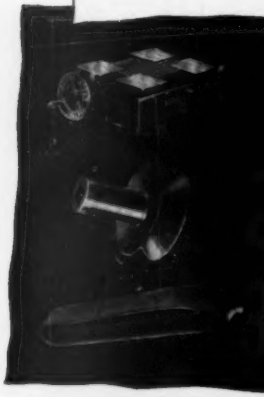
THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS

# REEVES
## Vari-Speed
## Motor Pulley

**Converts any standard, constant-speed motor to a Variable-Speed Drive**

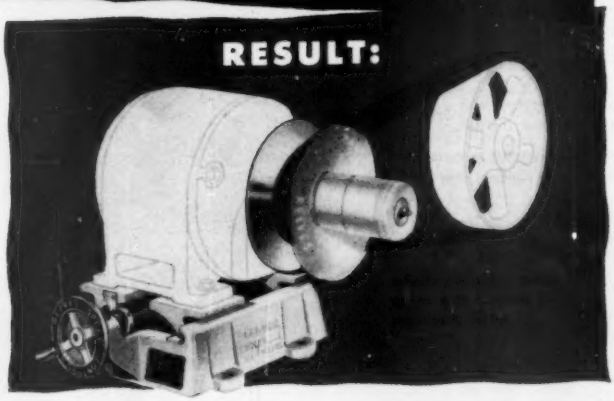


**REEVES Motor Base** provides sliding platform for motor. Handwheel or push-button control increases machine speed by moving motor toward driven machine; decreases speed by reverse movement.

**Disc assembly** mounts directly on motor shaft. This simple assembly consists of two cone-shaped discs and belt-tensioning spring.

**V-belt** connects disc assembly with driven machine.

**RESULT:**



● REEVES Vari-Speed Motor Pulley is the easiest, lowest-cost method of giving a constant-speed machine stepless speed adjustability. Eliminates all complicated electrical hook-ups, chain drives, gears, etc. . . . widens machine work range, increases rate of production and reduces production cost by providing the right speed for each operation under every changing condition—*without stopping the machine*. Send for complete information to Dept. F6a.

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*Recognized leader in the specialized field of variable speed control*

STEPLESS! ACCURATE! POSITIVE!

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Use the coupon on page 142 or 242 to get these important . . .

## Free NEW CATALOGS

*Begins on page 142*

### BUILDINGS

**8 Metal Framing**
You get 84 pages of ideas, photographs, drawings, and data on how to frame, hang, mount, and support mechanical and electrical equipment with adjustable metal framing. Reference tables. Unistrut Products Co.

**9 Roofing & Siding**
Here's an 82-page manual that gives complete data and specifications for maker's corrugated asbestos-cement roofing and siding. Drawings and photographs show methods of application and erection. The Philip Carey Mfg. Co.

**10 Paint**
A full line of paint products is described in this 16-page catalog. There are chips for each of the standard colors, and a program for color engineering in the plant. Section on interior and exterior primers and finishes. Barreled Sunlight Paint Co.

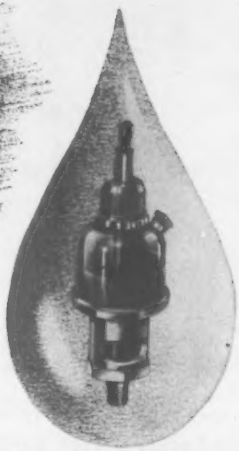
### MECHANICAL EQUIPMENT

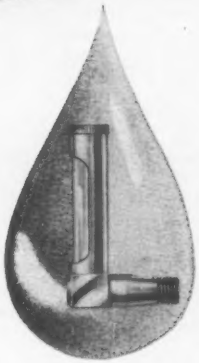
**11 Compressors**
Heavy-duty package types of feather valve compressors from 75 to 350 hp. are featured in this catalog (No. L-676-B1). Details on construction features, photographs of typical installations. Worthington Corp.

**12 Compressors**
Applications and design features of a line of single-stage centrifugal compressors is the subject of this 12-pager. Also covers functions, gives rating tables and detail photos. Bulletin No. 109. American Blower Corp.

*Turn the page*

# For Lubricating Devices Call On GITS First!





**GITS** Bros. covers the *entire range* of lubricating devices: Oil Hole Covers, Oil Cups, Grease Cups, Bottle Oilers, Gauges. Gravity-Feed, Wick-Feed, Constant Level, Vibrating Rod styles. Threaded or Drive-type. Elbow or Straight.

**GITS** Bros. offers the most complete selection of standard styles.

**GITS** consistent quality in design, materials and machining has made Gits Lubricating Devices the standard for industry for more than 40 years.

**GITS** Lubricating Devices are far-famed for solving tough oiling problems at low cost.

**GITS** Bros. Engineering Staff—true specialists in lubrication engineering—is at your disposal.

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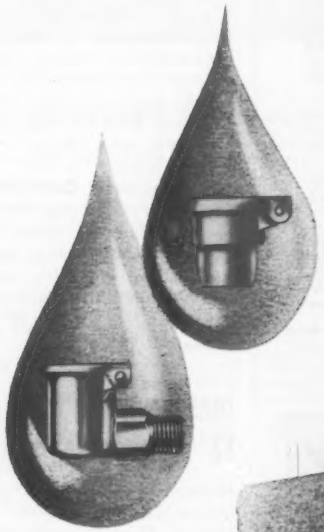

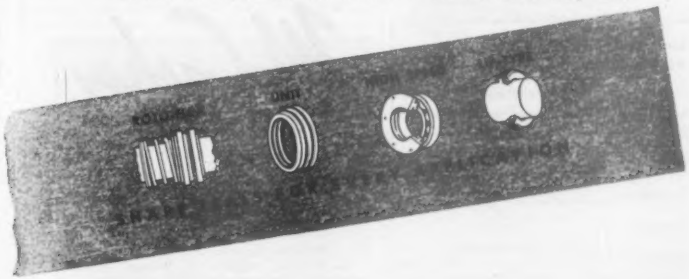

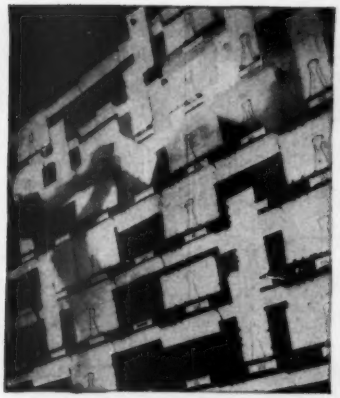

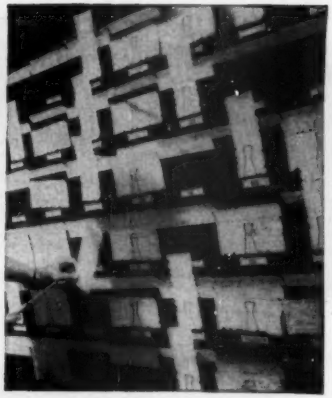

*One movement of Job Time Ticket on these McCaskey Boards directs dispatcher, move-men, set-up men and operators according to production plan . . . with*

# NO ASSEMBLY DELAYS FROM MISSING PARTS NO EXCESS WORK IN PROCESS

Barcalo Manufacturing Company, Buffalo, N.Y. has met the problems of dispatching production of a widely diversified line of products . . . from hand tools and metal furniture to pillows and mattresses . . . with McCaskey Machine Loading, Scheduling and Job Assignment.

Shop orders formerly were handled in a "blind file" and one or more parts often were overlooked or delayed with serious results. This is totally eliminated by the use of McCaskey Machine Control Boards and the following procedure developed by W. J. Navelle, Production Control Manager:

1. Job time tickets are pre-written without operators' clock numbers (see paragraph 7) and assigned to machines by Production Control Department.
2. They are placed by dispatcher in rear pockets of McCaskey Machine Control units in sequence specified by Production Control. Load is recorded on load cards.
3. Foreman selects jobs to be run next and moves tickets to front pockets of control units.
4. Dispatcher issues stores requisition for material, attaches to and notes action on job ticket.
5. Material move-man takes requisition to stores, delivers material to or near machine and marks ticket when move is complete.
6. Set-up man checks board, draws tools and dies and marks ticket when job is ready to run.
7. Job is assigned to operator by dispatcher; his number is written and starting time is stamped on ticket. Ticket then is visibly filed under clip spring at front of control unit.
8. When job is finished, dispatcher rings out ticket, enters production summary on permanent record and sends ticket to Production Control.
9. Production Control completes its record and sends ticket to Payroll Department.

Foreman, by quickly referring to McCaskey Board, selecting jobs to be run and moving job tickets thus provides instructions for (1) dispatcher, (2) move-men, (3) set-up men and (4) operators. Jobs are run and essential operations performed according to Production Control's plan. This McCaskey installation once again demonstrates how readily duplicated effort, delays and confusion are replaced by economical, planned production.

*Let us talk with you about a McCaskey procedure for your department or plant. Equally adaptable to line or job shop production, assembly, maintenance or individual job assignment. Mail coupon today for complete information.*

McCASKEY REGISTER CO.
ALLIANCE, OHIO

Please send me bulletins describing McCaskey Machine Loading, Scheduling, Dispatching and Job Assignment.

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Position .....

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THE McCASKEY REGISTER CO.
ALLIANCE, OHIO
McCaskey Systems, Ltd., Galt, Canada
The McCaskey Register Co., Watford, England


Use the coupon on page 142 or 242 to get these important . . .

## Free NEW CATALOGS

*Begins on page 142*

### 13 Silent Chain

In this 16-page catalog (No. 2510) you'll find engineering data on 3/16-in.-pitch chain for use where quiet, positive transmission of fractional horsepower is required. Typical applications are shown, including use as a conveyor. Link-Belt Co.

## AUTOMATIC CONTROLS

### 14 Solenoid Valves

A 4-page folder illustrates and describes maker's electrically operated valves for pressures up to 3000 psi. Features, specifications, operating and application data. The Atkomatic Valve Co.

### 15 Manual Control

This 4-page folder describes a manual control to switch on automatic operation and provide continuous indication of controller output. Illustrated with photographs and schematic drawings. Describes features and principles. The Swartwout Co.

### 16 Pneumatic Controller

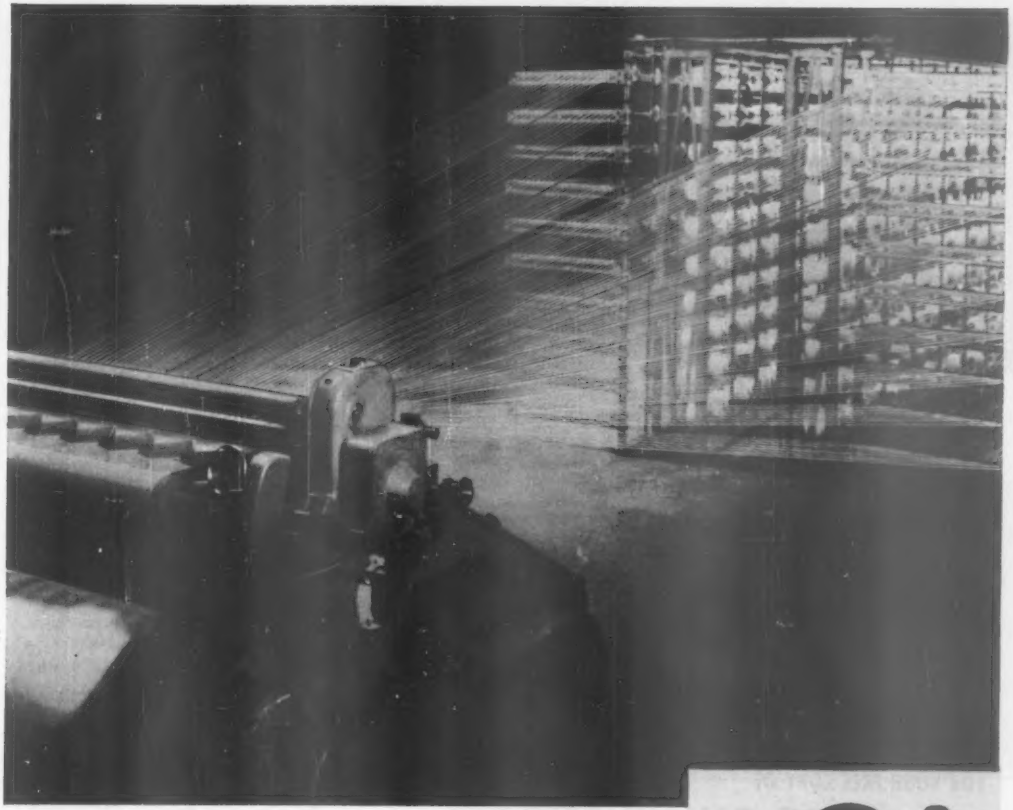
Here's a catalog (No. C-50) on a pneumatic controller for rate of flow, differential pressure, liquid level, viscosity, pressure, and temperature applications. Specs and features. 20 pages. Fischer & Porter Co.

## INSTRUMENTS

### 17 Temperature Recorder

You get complete details on temperature-recorder operation and construction in this 20-page catalog. Selection and reference sections, photographs of actual installations. Bulletin No. 447. The Foxboro Co.

*Turn the page*



(Photo: Courtesy of Robert Reiner, Inc.)

# Miles of Nylon filament with a problem in every inch . . . for SYNTHANE

You are looking at thousands of miles of the hair-fine filaments that go into nylon fabric.

Many equipment and processing problems must be worked out before these filaments emerge as blouses, curtains or couch covers. Synthane solves many of these problems. For example, to process nylon yarn, treatment with a corrosive size is necessary. Machine components made of Synthane laminated plastics stoutly resist corrosion.

The "elastic memory" of nylon causes the fit that endears nylon hosiery to women, but it also crushes ordinary bobbins on which the yarn is wound. Synthane laminated plastic bobbins successfully resist crushing.

Nylon filaments are glamorous. They are also so fine they must be handled gently. Synthane laminated plastic parts can be machined to snag-free super smoothness.

The properties that make Synthane laminated plastics essential to textile people may interest you. For information and ideas about how Synthane may be helpful to you, send for the Synthane Catalog. Synthane Corporation, 4 River Rd., Oaks, Pennsylvania.

Bobbins, pins and redraw caps made from Synthane laminated plastics. Synthane is also used for hosiery examining forms, measuring rolls, piping, gears, verge plates and many other textile parts.

*Synthane—one of industry's unseen essentials*

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LAMINATED PLASTICS

FIND OUT HOW YOU CAN PUT PORTABLE HEAT TO WORK FOR YOU!

HEAT-ON-WHEELS
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THE STORY OF HOW HERMAN NELSON PORTABLE HEATERS CAN SOLVE YOUR EMERGENCY HEATING PROBLEMS
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# HEAT-ON-WHEELS FOR INDUSTRY

You can avoid layoffs, speed work in cold areas, provide temporary heat for warehouses with Herman Nelson Portable Heaters. They also provide auxiliary heating for those extra cold days, or during loading or unloading operations, and for scores of other heating and drying jobs. Available in three models; cost as little as $360. Gasoline or electric driven. Capacities up to 450,000 BTU/hr.

***Find out how portable heaters can fit into your production picture. MAIL THIS COUPON TODAY.***

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American Air Filter Company, Inc., Moline, Illinois

Please send my free copy of HEAT-ON-WHEELS FOR INDUSTRY.

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Use the coupon on page 142 or 242 to get these important . . .

## Free NEW CATALOGS

*Begins on page 142*

**18 Flow Meters**
In Catalog No. 2300, there's a full line of flow meters for measurement, recording, indication, and integration of fluid flow. Types of remote measurement, for metering viscous flow. Specs, operating data, reference material included. Minneapolis-Honeywell Regulator Co.

**19 Tachometers**
Subject of this 20-page catalog is a line of recording and indicating electric tachometers. Models for measuring speed of rotation or travel, processing time, and other quantities. Engineering information. Catalog No. S1402. The Bristol Co.

### AIR HANDLING

**20 Dust Filters**
Bulletin No. 528 shows how maker's dust filters can help solve tough dust-control problems. Describes principles of operation, benefits of use. Charts and photographs included. 16 pages. The Day Co.

**21 Unit Heaters**
Vertical- and horizontal-shaft unit heaters are covered in this 48-page catalog. Gives construction details, dimensions, capacity tables, and information on unit selection and application. Bulletin No. 3570. American Air Filter Co., Inc.

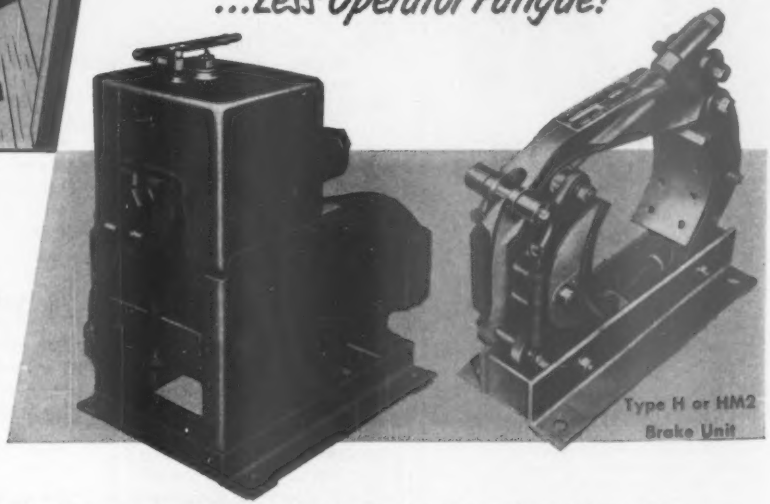
**22 Gas Heaters**
This 20-page catalog describes four types of gas heaters, gives specifications, dimensions, construction details, and equipment features. Illustrations and installation data. Catalog No. GN-52. Reznor Mfg. Co.

*Turn the page*

# Now... Wagner Powered Hydraulic Crane Bridge Braking

**for safer, more efficient Crane operation**

*...More Torque ...Greater Capacity ...Less Operator Fatigue!*




**Hydraulic power unit driven by totally-enclosed motor**

These new *Powered* Hydraulic Crane Bridge Brakes mean that your operators can bring even the largest crane to a safe, smooth stop at the touch of a toe. Loads can be spotted accurately—production can be stepped up—several brakes can be operated from one pedal—*all with less operator fatigue!*

Wagner Powered Hydraulic Braking Systems are designed for applications where frequent starts and stops are necessary . . . where close spotting is used . . . where large heavy equipment is involved . . . and for applications where exceptional ease of brake operation is desired.

Wagner Powered Braking Systems mean longer life for your equipment . . . Operators have less tendency to drag brakes and thus wear out wheels and lining quickly—cranes can be controlled without plugging the bridge motor with resultant damage to the motor and gears.

Wagner powered units can be added to your present Wagner Hydraulic Bridge Brake System. Investigate this new method of braking today—write for Bulletin IU-36 which fully explains and describes Wagner Powered Hydraulic Braking.

## Replacement Lining and Brake Wheels

Wagner offers the perfect combination of brake wheel and non-scoring lining for replacement needs. Wagner Brake Lining is specially designed and manufactured to meet the exacting service requirements of industrial braking. It is available in rolls, blocks, and discs.

**WAGNER ELECTRIC CORPORATION**
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AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

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2-53

Use the coupon below — or the duplicate on page 142 to get these

# IMPORTANT NEW Free CATALOGS

*Begins on page 142*

## MISCELLANEOUS

**23 Scaffolds, Ladders**
Selection and use of ladders and scaffolds for off-the-ground plant maintenance operations is the subject of Bulletin No. G-205. Gives specific recommendations for picking the right type of equipment for the job at hand. Patent Scaffolding Co., Inc.

**24 Magnet Separators**
Catalog on permanent magnetic separators for removal of abrasive ferrous particles and chips. Describes use of equipment in machine tool lubricating systems, hydraulic oil lines, and coolant systems. Tells how it works and how to use it. S. G. Frantz Co., Inc.

**25 Automatic Lubrication**
Information on planning centralized lubrication systems in this 4-page bulletin. Suggests layout, describes equipment required. Section on pumping units, outline of system's operation. Bulletin No. 529. Trabon Engineering Corp.

**26 Liquid Filters**
A line of liquid filters is described in this 12-pager. Contains specifications, engineering data, illustrations, and descriptions of filter media. Typical installations pictured. Bulletin No. D-IL. Dollinger Corp.

**27 Machine Tools**
For each item in a line of machine tools described in this 52-page catalog there are specifications, photographs, and application data. Index. Publication No. M-1776. The Cincinnati Milling Machine Co.

**28 Leather Packings**
Data file on leather packings gives design and application information, maintenance and installation hints. Describes U, Vee, cup, and flange packings for hydraulic and pneumatic equipment. J. E. Rhoads & Sons.

*For catalogs 29 through 45 see Plant Engineering Problems, page 244, and Plant Operating Problems, page 248.*

DUPLICATE COUPON ON PAGE 142

**MAIL THIS COUPON FOR FREE CATALOGS** *(Good until Feb. 28, 1953)*
FACTORY MANAGEMENT & MAINTENANCE (December, 1952)
330 W. 42nd St., New York 36

*I'm circling the numbers of the catalogs and bulletins I want:*

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| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 |
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## When You Need More Headroom...

● You'll find remarkably close headroom in the new trolley-mounted WRIGHT *Speedway* Hoist. From beam to hook is only 12¼" on the Frame 1.

This hoist is compact, ruggedly built, and perfectly balanced. It is designed with features that make it easy to use and give it unusually long life. Servicing is simplified by quick disassembly of parts or sections of the new WRIGHT *Speedway*. Wire rope is rigged to last longer and is easily replaced.

Here is a hoist you will like. It is priced right and will give you long, low-cost service. See your WRIGHT distributor right away or write us for literature on WRIGHT *Speedways* with capacities from ¼ to 10 tons.

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# U. S. TOBACCO COMPANY INSTALLS RANDOLPH AUTOMATIC FIRE SYSTEM

The U. S. Tobacco Company's large multiple unit dust collector presented an unusual and worrisome fire hazard, but this 150 pound Randolph Automatic System not only automatically detects and extinguishes any fire that might occur in the unit, but also shuts down the dust collector blower, and rings an alarm located on one of the lower floors of the building.

*Officials of the U. S. Tobacco Co., and the Nashville Fire Department inspect the Randolph Automatic System installed on giant dust collector.*

## Kills Fire, Sounds Alarm and Shuts Down Machinery

As in the U. S. Tobacco installation, Randolph Systems, in addition to automatically killing the toughest fires in split seconds, can also be equipped with duct and door closers, motor, fan and machinery shut-offs, warning alarms and other auxiliary safety devices. Systems are designed for both local application or total room flooding and are ideal for dip tanks, baking ovens, spray booths and hundreds of other applications.

*Battery of Randolph $CO_2$ Cylinders in U. S. Tobacco system.*

***Free Catalog and Engineering Service Available Without Cost***

Randolph's FIRE HAZARD INDEX gives correct equipment and methods for protection against 590 typical fire hazards. Write for your free copy today. Address: Randolph Laboratories, Inc., 4 E. Kinzie St., Chicago 11, Ill.

## Good Ways to Solve Special PLANT ENGINEERING PROBLEMS

You can get catalogs suggested as answers to these problems by using coupon on page 142 or 242.

**NEED WIRING FOR SEVERE SERVICE?** Here's a type that doesn't need conduit, says General Cable Corp. of its "Safety m.i." mineral-insulated wiring. What's more, it's both fireproof and fire preventive. You can specify it for a variety of lighting, power, and control circuits — especially where heat, moisture, or oils are present. *(Circle No. 29 on coupon, page 142 or 242.)*

**TO PROTECT INSTRUMENT TUBING,** T. J. Cope, Inc., suggests Instrof prefabricated steel troughs and fittings. They eliminate costly field fabrication and clamp installation, and provide a continuous support for tubing. Available in widths 1½ to 3 inches high, says Bulletin No. 65-1 *(Circle No. 30 on coupon, page 142 or 242.)*

**AN EASY WAY TO SOLVE TANK HEATING AND COOLING** problems is to use Platecoils. Kold-Hold Mfg. Co. says they save time, money, and manpower by heating or cooling 50% faster and take half the space and weigh half as much as pipe coil. Bulletin No. IP-251. *(Circle No. 31 on coupon, page 142 or 242.)*

**ARE OLD RECORDS MONOPOLIZING VALUABLE SPACE?** Eliminate old-fashioned boxes and transfer cases and use your "sky room," says Equipto, Div. Aurora Equipment Co. You can stack records tightly and neatly in racks up to 10 feet high that take up only 1x3 feet of floor space. Another benefit: It's easy to locate old records. *(Circle No. 32 on coupon, page 142 or 242.)*

*Turn the page*

SYLPHON CONTROLS FOR DEPENDABILITY

BETTER THAN ANY HAND

...for efficient, economical process control

● An automatic Sylphon Control can do a better job, any time, than hand-operated valves or "guess methods" do at governing temperatures. For Sylphon Controls maintain temperature that assures *uniform* processing conditions . . . *constant* product quality. They help reduce spoilage, wasteful overheating . . . save manpower and manhours. They do their jobs dependably—day in and day out.

Sylphon Temperature Regulator No. 999, pictured here, is one of the Sylphon line. Its outstanding features include stainless steel frame for minimum heat conduction from valve to regulator head . . . large size 2-ply Sylphon bellows for added power . . . less height and weight than other types. Self-operating—requires no auxiliary power source. Particularly suited for storage water heaters, metal plating tanks, bottle washers, treaters, slashers, etc.

Find out about the advantages of No. 999, or of other Sylphon Regulators, for maintaining *constant* processing control temperature. Write for Catalog XF-A.

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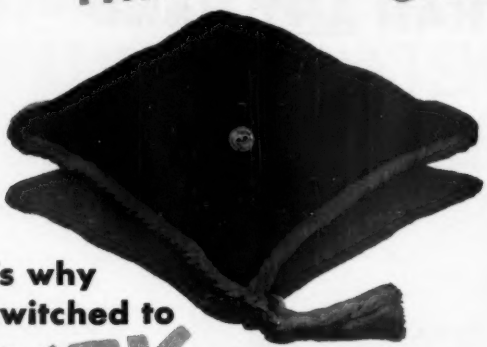
*Temperature Controls • Bellows Devices • Bellows Assemblies*

FULTON SYLPHON
DIVISION

ROBERTSHAW-FULTON CONTROLS CO., KNOXVILLE 4, TENN.

*Canadian Representatives, Darling Brothers, Montreal*

# HERE'S THE BUTTON THAT COST $300



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# KEX Wiping Towels

"That little shirt button did $300 worth of damage. When Joe used an old shirt to wash up the press, he didn't see the button. It damaged the plate, it stopped production and cost the company $300."

This wouldn't have happened if Joe had used a Kex wiping towel—they're safe because they're *made* for wiping—they're uniform in size and absorbency. There's no time wasted in searching for just the right piece for the right job.

**KEX IS A NATIONAL SERVICE.** No matter where you are—whether your company is large or small—the Kex representative can work out a system of supplying wipers that will save *you* money. You pay only a small monthly rental and you get a systematically controlled supply of uniformly-sized, super-absorbent Kex as often as you need them. Nothing to buy—no big inventory to store. Why wait?

***For complete information see your Classified Telephone Directory for nearest Kex distributor, or write Kex National Service, 295 Fifth Avenue, New York 16, N. Y.***

## "KEX" NATIONAL SERVICE

**REG. U.S. PAT. OFF.**

***It isn't Kex unless it's imprinted with the Kex name.***


*Begins on page 244*

Good Ways to Solve Special

# PLANT ENGINEERING PROBLEMS

You can get catalogs suggested as answers to these problems by using coupon on page 142 or 242.

**TO CUT COSTS OF APPLYING INSULATION,** investigate Nelwelding. Nelson Stud Welding says you can use welded studs to install all types of insulation material fast and economically. Booklet shows how. *(Circle No. 33 on coupon, page 142 or 242.)*

**HOW TO TAKE BETTER CARE OF WIRE ROPE,** says A. Leschen & Sons Rope Co., is a big problem—solved by its 72-page pocket-size handbook. There's information on proper methods of specifying, handling, reeving, breaking-in, splicing, cutting, and lubricating your wire rope. *(Circle No. 34 on coupon, page 142 or 242.)*

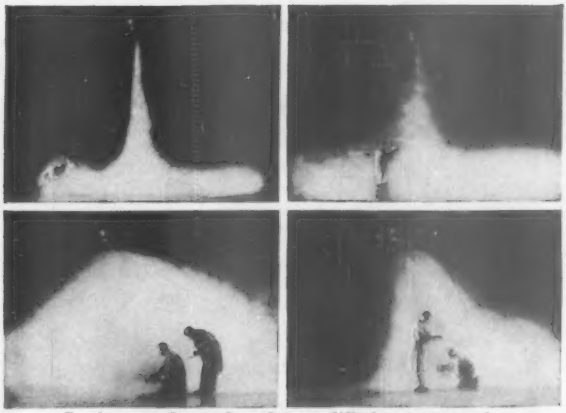
**WHEN CONCRETE FLOORS DON'T STAND UP** against wear, moisture, or attack from chemicals or cleaning compounds, it's time to coat with Floorkote, says Tropical Paint & Oil Co. This rubber-base paint enamel can be applied to any kind of concrete—old or new. Dries in four hours to a tough, lustrous surface, ready for severe use. *(Circle No. 35 on coupon, page 142 or 242.)*

**TO KEEP FERROUS CONTAMINANTS OUT OF PIPELINES:** Permanent magnet pipeline traps will do the trick, says Eriez Mfg. Co., in protecting pumps, screens, grinders, filters, and similar processing equipment from damage due to tramp iron. The traps won't corrode, are not affected by high temperatures. Catalog No. B-203. *(Circle No. 36 on coupon, page 142 or 242.)*

*Turn the page*

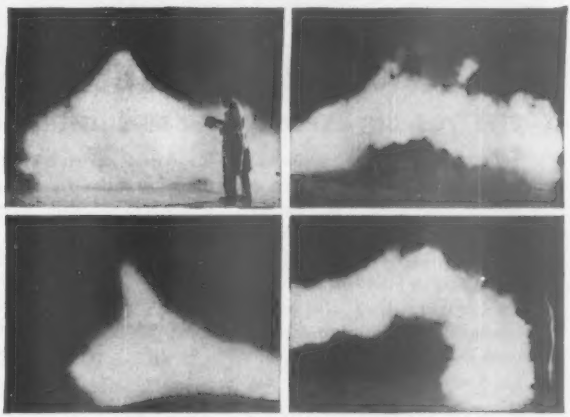
# Patented diffusers on TRANE unit heaters put heat right where it's needed !

**EXCLUSIVE LOUVER CONE DIFFUSER** on TRANE Projection Heater concentrates hot air stream for additional throw. Diffuses heat gently, directs it where needed, pinpoints cold spots—all with finger tip control. It taps waste ceiling heat, projects it down to floor line. Ideal for craneways, aisles, bays, hundreds of other places.



Smoke tests show a few of many diffusion patterns of Projection Heater with Louver Cone.

**EXCLUSIVE LOUVER FIN DIFFUSER** gives new versatility to the TRANE Model H horizontal discharge unit heater. Countless diffusion patterns are now available—divided streams, gentle blanket, spot throw. TRANE also makes the Torridor, a blower unit for large volume heating, deluxe cabinet units and gas fired units. All in a complete range of capacities.



Louver Fin Diffuser adds directional control to horizontal discharge Unit Heater.

**TRANE Float Trap** (shown). TRANE bucket traps and thermostatic traps are matched to TRANE Unit Heaters to give perfect results for either high or low pressures.

For complete information about how TRANE Unit Heaters and Diffusers can solve your heating problems, see your nearest TRANE sales office or write TRANE at La Crosse, Wisconsin.

MANUFACTURING ENGINEERS OF HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

TRANE

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Eastern Mfg. Division, Scranton, Pa.
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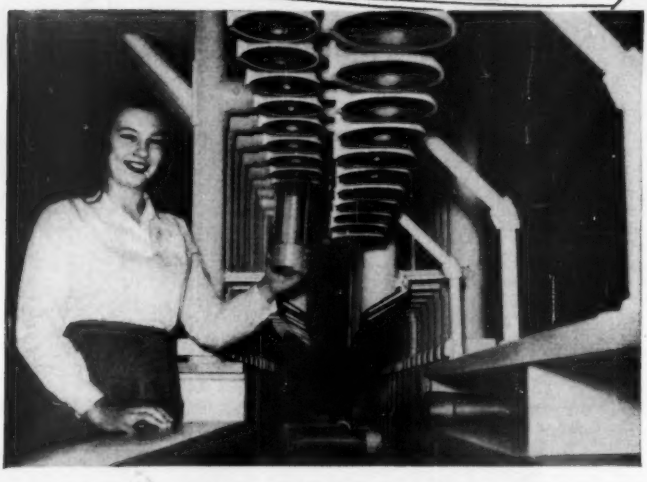

## STANDARD PNEUMATIC TUBE SYSTEMS

**GIVE YOU AIR EXPRESS INTER-DEPARTMENT SERVICE**

For safe, swift communication and transport — without delay or dependence on periodic messenger service — between departments — floors — buildings — investigate Standard Pneumatic Tube Systems. They "fly" memos, instructions, letters, records, small parts and tools, merchandise, money, from point to point — nonstop — within your office or plant. Reduce messenger and telephone service. Users report savings as high as $10,000 in 9 months' time.

Standard Pneumatic Tube Systems can be installed for a wide range of needs in industrial plants, warehouses, office buildings, mail-order houses, hotels, hospitals, stores, banks — wherever delivery service between departments and buildings needs to be expedited.

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CONVEYORS


Good Ways to Solve Special

## ▶ PLANT OPERATING PROBLEMS

You can get catalogs suggested as answers to these problems by using coupon on page 142 or 242.

**FOR EFFICIENT METAL MELTING,** consider the Eclipse non-crucible direct-fired reverberatory furnace, suggests Eclipse Fuel Engineering Co. Its continuous-charge, continuous-pour operation is said to assure fast, low-cost production of quality castings. *(Circle No. 37 on coupon, page 142 or 242.)*

**TO HELP YOU COMPARE FORK TRUCKS,** there's a chart offered by Lewis-Shepard Products, Inc. It lists 27 points to consider when judging fork trucks. You fill in the blank spaces with specs of trucks you're considering. Use the results for selection or for reference. *(Circle No. 38 on coupon, page 142 or 242.)*

**WHAT TYPE OF PLANT LAYOUT EQUIPMENT TO USE?** Visual Planning Equipment, says the company of the same name. It gives you a comparative analysis, made by a large aircraft company, of four types of layout equipment. *(Circle No. 39 on coupon, page 142 or 242.)*

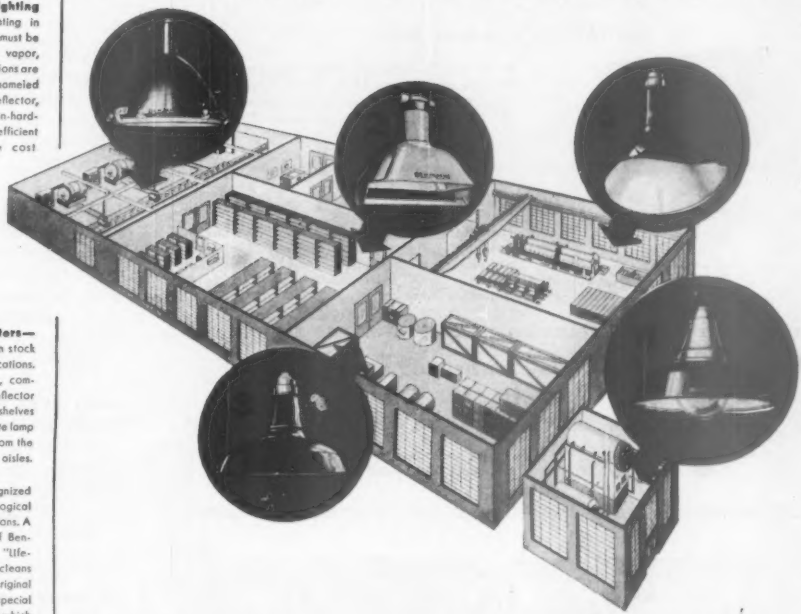
**TO SIMPLIFY HANDLING AND PROCESSING,** Cambridge Wire Cloth Co. has developed broad, flat-bodied woven wire slings. They're long lasting, flexible, and low on maintenance. And you can use them for everything from pickling thin-walled tubing to positioning an extra-heavy armature. *(Circle No. 40 on coupon, page 142 or 242.)*

**NEED TO CONTROL BIN LEVEL?** One way is to use Foxboro Co.'s Model 40 Rotax Controller. When the bin is filled to the proper height an alarm warns the oper-

# HOW TO IMPROVE PLANT LIGHTING
## through the Specification of Benjamin
# INCANDESCENT LIGHTING UNITS

***GOOD PLANNED LIGHTING** recognizes the importance of specifying **INCANDESCENT LIGHTING UNITS** where their application will economically solve lighting problems due to location, atmospheric condition, seeing task or cost limitation.*

**1 "STEELITE" Armor-Clad Lighting Units**—Designed for good lighting in Foundries, Mills, etc., where units must be mounted high and where smoke, vapor, dust or other severe service conditions are present. Heavy-gauge porcelain-enameled steel housing, Alzak aluminum reflector, heat-resisting glass cover and non-hardening gasket cover-seal assure efficient operation at low maintenance cost



**2 "STOCK-BIN-LITE" Reflectors**—Efficiently lights shelves and bins in stock rooms, tool cribs and similar locations. The deep-skirted reflector shape, combined with exclusive V-shaped deflector bar provides uniform illumination of shelves and bin tiers, while assuring adequate lamp shielding to prevent direct glare from the lamps when looking down the aisles.

**3 RLM DOME Reflectors**—Recognized throughout industry as the most logical choice for thousands of plant locations. A top favorite for years because of Benjamin's battle-ship durability and "Life-Time" Porcelain Enamel which cleans easily and permanently retains its original high lighting efficiency. Available in special Benjamin "Turnlox" hood design which permits reflector and lamp removal as one unit for cleaning on floor or bench.

**4 "HEAVY-DUTY" VAPOR-TIGHT Lighting Units**—Rugged, weather-proof vapor-tight units have heavy-gauge porcelain-enameled steel reflectors with non-corroding copper neck and aluminum cast hoods. "Made to order" for boiler rooms, pump houses and similar locations, where steam, moisture and non-hazardous vapors demand lighting equipment which can withstand the deteriorating effects of such atmospheres without break-down or need for frequent servicing and replacement.

**5 "ELLIPTICAL ANGLE" Reflectors**—For lighting from the side; specially built to overcome lighting difficulties caused by overhead obstructions like travelling cranes or tall machinery. Elliptical reflector shape not only directs light forward, but also to the sides. This helps build up illumination laterally, so light is adequately overlapped between units to prevent harsh shadows and annoying contrasts.

From the standpoint of economy, performance and adaptation to special environmental and operational conditions, Benjamin incandescent industrial lighting units are the best possible solution to many plant lighting problems. Good planned lighting, therefore, utilizes Benjamin incandescent units whenever their advantage is indicated.

Spotted around the model factory layout above, are typical examples of the application of Benjamin incandescent industrial units to plant lighting problems. In addition to solving these problems, the specification of Benjamin equipment brings the extra benefits of Benjamin "built-like-a-battleship" construction and Benjamin design advancements which facilitate maintenance and reduce operating costs.

How Benjamin incandescent lighting units may be used to solve plant lighting problems, is explained in the new Benjamin manual, "A Planning Guide to Improved Plant Lighting." This 36-page guide demonstrates the application of the 12 major Benjamin Lighting Systems to factory lighting problems, and contains much data relating to the use of incandescent lighting units for special "problem locations," such as are indicated above.

Your FREE COPY of the GUIDE will gladly be sent without cost or obligation. Simply address your request to: Benjamin Electric Mfg. Co., Dept. N, Des Plaines, Illinois.

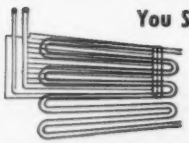
**BENJAMIN**
*Lighting Equipment*
**INCANDESCENT**
RS177 Sold Exclusively Through Electrical Distributors

Now Available

STAINLESS STEEL PLATECOILS

REPLACE PIPE COILS

to SAVE YOU 50% in TANK HEATING and cooling

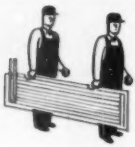


**You SAVE 50% in tank SPACE**

A 22" x 47" Platecoil gives the same heat transfer surface as 32 ft. of 1½" pipe. This pipe requires a space approximately 30" x 60". Platecoil thus saves about 50% over equivalent pipe coil in space inside your tank.

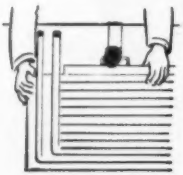
**You SAVE up to 50% in initial COST**

The initial cost of stainless steel Platecoil is often 50% or more below the cost of equivalent pipe coil. Less time is required to install Platecoil with corresponding saving in installation labor.



**You have 50% LESS WEIGHT to handle**

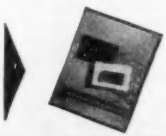
Weighing only about half as much as equivalent pipe coil, Platecoil is easy to handle. A whole maintenance crew is not needed to transport and install it.



**You SAVE 50% in maintenance LABOR**

The Platecoils can be replaced in a matter of minutes and without emptying the tank. There is no need for workmen to get inside the tank in order to make replacements.

*Send for your free copy of the new brochure of Platecoil applications. Write for Bulletin No. P60.*



*Begins on page 248*

## Good Ways to Solve Special PLANT OPERATING PROBLEMS

You can get catalogs suggested as answers to these problems by using coupon on page 142 or 242.

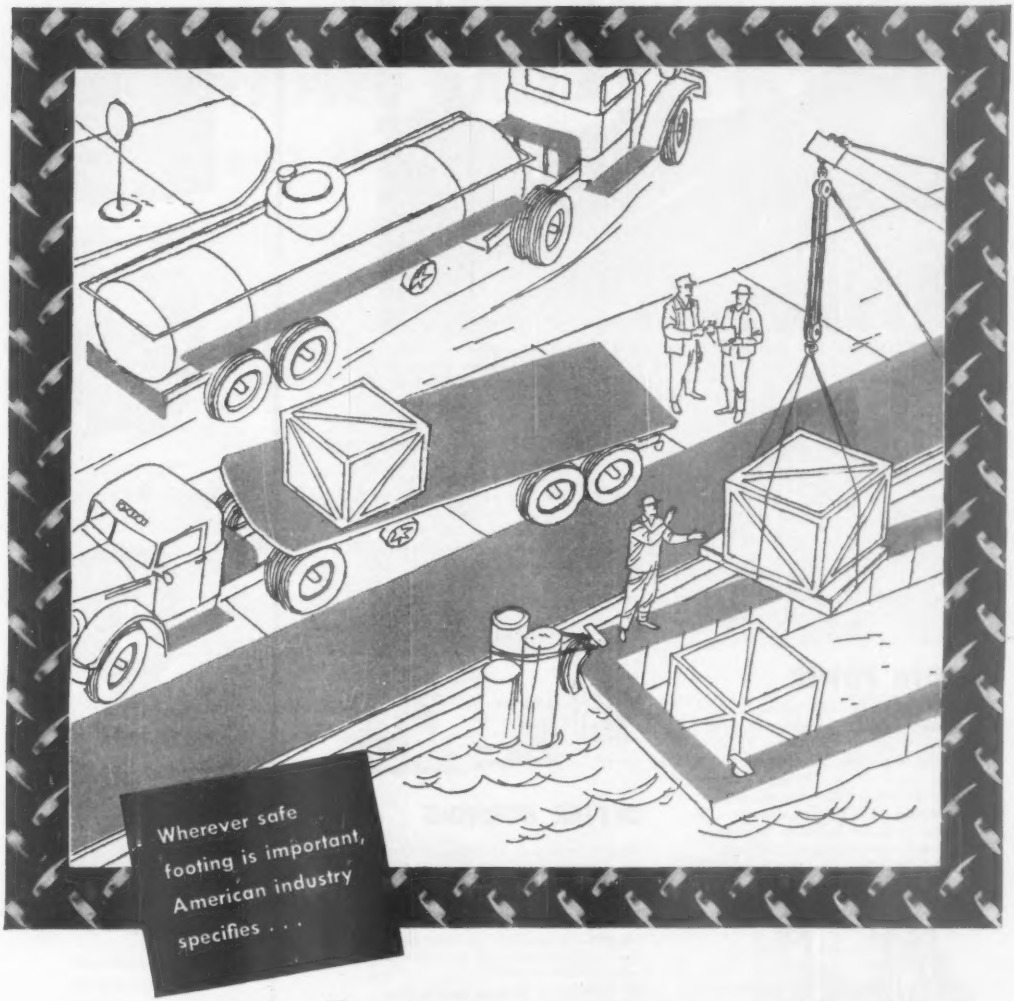
ator. You can tie it in with motor-driven equipment to empty the bin when the desired level is reached. Data sheet No. 823-12. *(Circle No. 41 on coupon, page 142 or 242.)*

**TO CUT COSTS ON HEAT TREATING AND PROCESSING,** increase the capacity of the equipment. You can do it, says Pressed Steel Co., with lightweight container units. A 24-page catalog (No. 52) shows you the full line. *(Circle No. 42 on coupon, page 142 or 242.)*

**WANT YOUR PRODUCTS TO WITHSTAND SEARING HEAT?** Coat them with ceramics, says Ryan-Cameo. Coatings developed for jet aircraft applications may also help solve your high-temperature spec problem. *(Circle No. 43 on coupon, page 142 or 242.)*

**TO BOOST PRODUCTION PER DIE DRESSING UP TO 8 TIMES:** The new X-60 drawing compound does just that by limiting heat generated, says Metalloid Corp. The material becomes active at a temperature of 550F., well below the critical temperature of dies and work. *(Circle No. 44 on coupon, page 142 or 242.)*

**FOR FAST, ACCURATE MASKING** of protected areas when baking anodized surfaces, pressure-sensitive Quik Masks come precut for instant application. W. H. Brady Co. can supply stock and special masks to meet your needs. Masks are readily removed after baking. *(Circle No. 45 on coupon, page 142 or 242.)*




# INLAND 4-WAY SAFETY PLATE

Because ACCIDENTS are COSTLY, safe, sure footing pays off in higher production, better fire protection and lower insurance rates.

Men "on the move" appreciate the non-skid, slip-resistant qualities of Inland 4-Way Safety Plate. They work faster and more efficiently; morale is generally higher.

The long-lasting qualities of Inland 4-Way Safety Plate means lower maintenance and replacement costs —fewer repairs.

You'll be wise to use Inland 4-Way Safety Plate on all danger spots in your plant and as standard equipment for your products. It's a worthwhile investment any way you look at it.

Available from Leading Steel Jobbers

•

WRITE FOR BULLETIN F-1

**INLAND STEEL COMPANY**

38 SOUTH DEARBORN STREET • CHICAGO 3, ILLINOIS

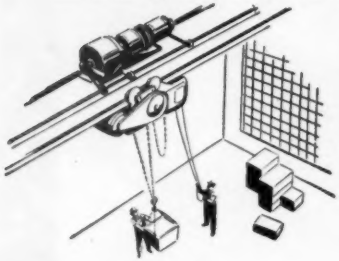
*SALES OFFICES: Chicago • Davenport • Detroit • Indianapolis • Kansas City • Milwaukee • New York St. Louis • St. Paul*

*PRODUCTS: Sheets, Strip, Tin Mill Products, Bars, Plates, Structural Shapes, Sheet Piling, Reinforcing Bars, Pig Iron, Rails and Track Accessories*

INLAND

# American Blower . . . a time-honored name in air handling

**San Francisco** has a conveniently located American Blower office to provide you with data and equipment for air handling. You can reach American Blower in San Francisco by calling Sutter 1-1024. In other cities, consult your phone book.



## SMOOTH POWER

If you're concerned with power transmission you'll want to know more about our Gyrol Fluid Drives. They offer three important advantages—smoother acceleration, overload protection and substantial power savings. One company uses Fluid Drive on a crane that picks up ladles of hot metal. Before they were installed, the ladles got a violent swing from the quick start and were hard to control. Since using Fluid Drives they've had no trouble.

## R FOR AIR

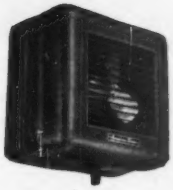
One of the stiffest tests air handling equipment can get is that imposed by hospital laboratories. Cultures and tests require a sterile atmosphere.

Temperature and humidity must often be closely controlled. Recently, a large university hospital selected American Blower ventilating equipment for its new laboratory . . . a fine tribute not only to the quality of American Blower products, but also to the effectiveness of our research and testing methods. Why not put this valuable experience to work for you?

## BETTER BURNING

American Blower Mechanical Draft Fans play an essential part in the efficient operation of several new municipal waste disposal works. The high static efficiency, low RPM, low tip speed and rugged construction of these dependable fans help provide and maintain proper combustion without high power costs. In military or civilian installations American Blower equipment meets the most exacting requirements. If you are expanding or enlarging your facilities, consult us.

If your needs call for heating, cooling, drying, air conditioning or air handling equipment you'll find American Blower an excellent source of supply. For data phone or write our nearest branch office.

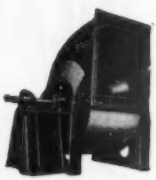


Unit Heaters

Mechanical Draft Fans

Dust Collectors

Centrifugal Compressors



Industrial Fans

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary corporation

**YOUR BEST BUY AMERICAN BLOWER AIR HANDLING EQUIPMENT**

*Serving home and industry:* AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

# Here's why *Wakefield* uses CERTIFIED BALLASTS in all their fluorescent fixtures

"We equip all our fluorescent fixtures with Certified Ballasts because we find our distributors, the contractors who make the installation and the users all are more satisfied with results when Certified Ballasts are installed," says A. F. Wakefield, president of The F. W. Wakefield Brass Company, Vermilion, Ohio.

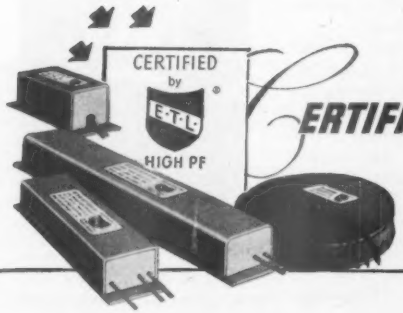
His conviction is shared by many other manufacturers who have learned that CERTIFIED BALLASTS assure—

**Full Lamp Life** **Rated Light Output** **Maximum Ballast Life**

CERTIFIED BALLASTS are made to precise specifications, then tested by Electrical Testing Laboratories, Inc., which certifies they conform to these high standards.

Write for complete information on the types of CERTIFIED BALLASTS available from each participating manufacturer.

*Participation in the CERTIFIED BALLAST program is open to any manufacturer who complies with the requirements of CERTIFIED BALLAST MANUFACTURERS.*




## CERTIFIED BALLAST MANUFACTURERS

*Makers of Certified Ballasts for Fluorescent Lighting*

**2116 KEITH BLDG., CLEVELAND 15, OHIO**

# YOU MUSTN'T MISS—

**INDUSTRIAL NEWS,** TO STIMULATE YOUR THINKING, ON EVERY PAGE

**TIMELY HINTS TO BETTER MANAGEMENT** ON PAGE 266

**QUOTES** FROM INDUSTRY'S LEADERS ON PAGE 276

**IDEAS** BEGINNING ON THIS PAGE

Main-size Santa gets a full set of chin whiskers just as fast as . . .

| ELEMENTS | Standard Time (in minutes) |
|---|---|
| 1. Get beard from pile | 0.0336 |
| 2. Get brush, dip, wipe, and bring to beard | 0.0444 |
| 3. Apply cement carefully to beard, 4 locations | 0.1272 |
| 4. Re-dip brush | 0.0444 |
| 5. Brush face, use care around eyes and ears | 0.1500 |
| 6. Lay aside brush, return hand to work | 0.0268 |
| 7. Move beard to face, press carefully in 4 locations to secure firmly | 0.1338 |
| Total | 0.5602 |

. . . standard times specify operation.

# Setting Standards on Santa

INDUSTRIAL NEWS

Don't let your kids tell you there is no Santa Claus. There are hundreds of them—sitting, standing, bathing, driving reindeer, playing harps, piloting flying saucers. There are 40-ft. Santas, man-size Santas, pint-size Santas; Mrs. Santas, baby Santas.

Want to see for yourself? You don't have to take a trip to the North Pole. Just walk along the assembly line at Gardner Displays, Inc., Pittsburgh, during the fall of any year.

You can watch Santa grow from the gleam on the carpenter's saw to the well-dressed, well-stuffed gentleman in red who rocks and rolls with laughter in the local department store window. What's more —and this is for those who like a Christmas story with a message—even with the apparent haphazard

Pint-size Santa has a full set of time standards, too.

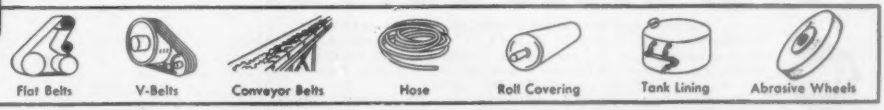
# "DOWNTIME-SAVERS"

# Condor V-BELTS

You save downtime for belt take-up and belt replacement when you use Condor V-Belts. There are good reasons . . . Condor V-Belts are destretched and balanced by R/M engineering during manufacture . . . and they are made with straight sidewalls for more grip. As a result, each Condor V-Belt in a multiple drive pulls its share of the load without stretching, sagging or slipping. That's why, all Condor V-Belts run longer, save time and money • Bulletin 6868-E, "Grips the Grooves," describes other advantages of the "Smoothest Running V-Belts Made." Write for it, or call your R/M Distributor.

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

**RAYBESTOS-MANHATTAN, INC.**




Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Packings • Brake Linings • Brake Blocks Clutch Facings • Asbestos Textiles • Sintered Metal Parts Bowling Balls

# The U. S. Steel Supply team

## that gives you

## *personalized service*

## Our salesman puts this team to work for you!

SUPPLYING your steel requirements becomes our team objective when you tell your needs to your U. S. Steel Supply salesman. Behind your salesman is a team of technical experts, each one a specialist in his field . . . and your business receives the attention of every member of the team who can contribute to its progress.

What do you need? Steel? Tools? Special purpose equipment or machinery? Advice on working an unfamiliar type of steel? Help in meeting a pressing delivery date? Give your order to your U. S. Steel Supply salesman. He will see that it gets immediate attention from the U. S. Steel Supply specialists best qualified to serve you.

***YOUR "ONE CALL" SOURCE OF STEEL SERVICE***

# U. S. STEEL SUPPLY

UNITED STATES STEEL SUPPLY DIVISION, UNITED STATES STEEL COMPANY
HEADQUARTERS: 208 So. LA SALLE ST., CHICAGO 4, ILL. · WAREHOUSES COAST-TO-COAST
Warehouses and Sales Offices: BALTIMORE · BOSTON · CHICAGO · CLEVELAND · LOS ANGELES · MILWAUKEE
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USS

UNITED STATES STEEL


# YOU MUSTN'T MISS—

*Begins on page 254*

nature of this big job-shop operation, there's a standard time for every bend in every elbow, every curl in every beard—everything except Santa's smile.

Why no standards on the smile? "Ho, ho, ho," roars a 40-ft. Santa. "Imagine getting standard data for *my* grin! You'd need a team of time study men on horseback to measure every crinkle in Ole Kris Kringle!"

We'll just have to take his word for it.

### Atomic Power Step Nearer

Atomic power for your plant came a step closer recently when the Atomic Energy Commission welcomed more industrial participation in the $1-million government-industry program to produce an efficient nuclear reactor.

The AEC lifted the security lid for selected scientists and engineers employed by 11 companies, mostly utilities. They'll work with Dow Chemical Co. and Detroit Edison Co. on research now underway to produce cheap atomic power.

Good news, too, for interested companies not yet participating. AEC says it will still consider getting more companies into the cooperative industry venture.

**Background** · Reactors that produce useful power have already been built and put to work for experimental purposes (FACTORY, April 1952, page 118). Trouble is, the cost per kilowatt hour developed by existing reactors is far too high.

You'll have to wait 5 to 15 years for a reactor that will produce cheap power, according to some estimates. But all agree on this point: The quicker industry gets into the atom-power business, the quicker it will come.

*Turn the page*

# Control of trucks by G-E 2-WAY RADIO...

# INCREASES UTILIZATION 100%

**Nicholas Cannoe,** The Electric Storage Battery Co. dispatcher, co-ordinates assignments and issues instructions via General Electric 2-way radio.

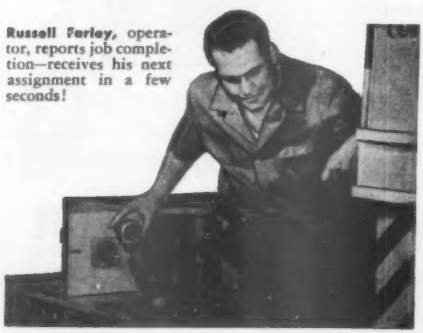
THE Electric Storage Battery Co., at its Crescentville, Philadelphia Plant, solved a supervision problem with G-E two-way radio. *Truck utilization was increased 100%* on 104 materials handling trucks covering 20 acres! Duplication of assignments is eliminated, operators clearly understand instructions, valuable production time is saved. Outdoor operations in rainy weather and rough usage every day present no problem. Their G-E two-way radio has proved completely dependable... averaging over 70 calls per day.

Successful municipal, oil, lumber, and a host of other installations have represented huge savings in time and money wherever efficient, controlled operations was a factor. How much does instant communication mean to your business?

No matter what your communication problem is, consult the CAS* man at the G-E office near you. Call him today.

**Communications Advisory Service*

**Russell Farley,** operator, reports job completion—receives his next assignment in a few seconds!



***Instant Communication* can mean more profit to your business!**

General Electric Company, Section 65122
Electronics Park, Syracuse, New York

Please send me information on G-E communication systems for industry.

NAME.....

TYPE OF BUSINESS.....

ADDRESS.....

CITY.....STATE.....

GENERAL ELECTRIC

If you have a

**FACTORY PROBLEM**

in production, assembly, packaging, shipping

You can save time and money with the proper use of

**SEAMLESS F.O.S. INDUSTRIAL TAPE**

For masking, holding, packaging, backing, hinging, protecting, reinforcing, identifying, splicing, sound-proofing, insulating, stenciling, bundling, sealing, binding

USE SEAMLESS

**F.O.S. Industrial Tape**

**Call or Wire**

collect for authoritative advice and suggestions. Prices, catalogues, samples on request. Tape to meet govt. specifications. Wire details collect for 24-hour reply.

"Originators of Pressure-Sensitive Industrial Tape"

1877 75th Anniversary 1952

WIRE INDUSTRIAL TAPE DIV. A

THE SEAMLESS RUBBER COMPANY

NEW HAVEN 3, CONN., U. S. A.


# YOU MUSTN'T MISS—

*Begins on page 254*

## What's Ahead in Handling?

A dispatcher, sitting at a pushbutton station console directing materials handling traffic by putting signals on magnetic memory tapes.

That's only one of the big materials handling changes in store for the factory of the future, according to Stephen W. Jessop, chief estimating and designing engineer for Jervis B. Webb Co., materials handling consultants and manufacturers.

He also sees the use of resonant pick-up coils and oscillators to provide dispatching signals on materials handling systems without need for contact between shoe and wipers. By controlled radio frequency, he adds, a selector box on a truck or carrier will open the designated switch. His company is at present completing experiments on stacked, tuned condensers used in the station selector box.

**Today's equipment** · Jervis B. Webb Co. finds that most of its customers request the automation built right into the equipment. Says Jessop:

"At the present time, 90% of the materials handling equipment we are called on to design, estimate, engineer, and erect, requires some form or other of *special* electrical circuits. This equipment ranges from completely automatic materials handling machines and systems to the responsibility for wiring-in a simple belt conveyor to the purchaser's service sources.

"The larger companies, as a rule, now include in their specifications the requirements that all electrical wiring be included in the contract for the materials handling equipment. The same is true for the vendors in the processing groups."

*Turn the page*

WHEN YOU USE

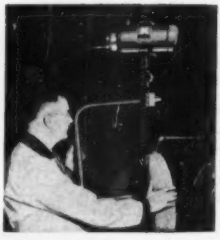
**KELLER Air Hoists**

**BECAUSE** Keller Hoists stand up to the toughest kinds of industrial service. Maintenance costs are negligible.

**LIGHT WEIGHT**—300 and 1,000-lb hoists weigh only 30 lb; 1-ton model only 75 lb.

**CONTROLLED SPEED** with finger-tip control; lets the operator spot loads accurately.

**CAN'T BURN OUT** from stalling . . . nor can the air motor be injured by dust or fumes.



Mounting grinding wheel on a grinder. There are dozens of such uses in manufacturing plants.

**SEND FOR DETAILED INFORMATION**

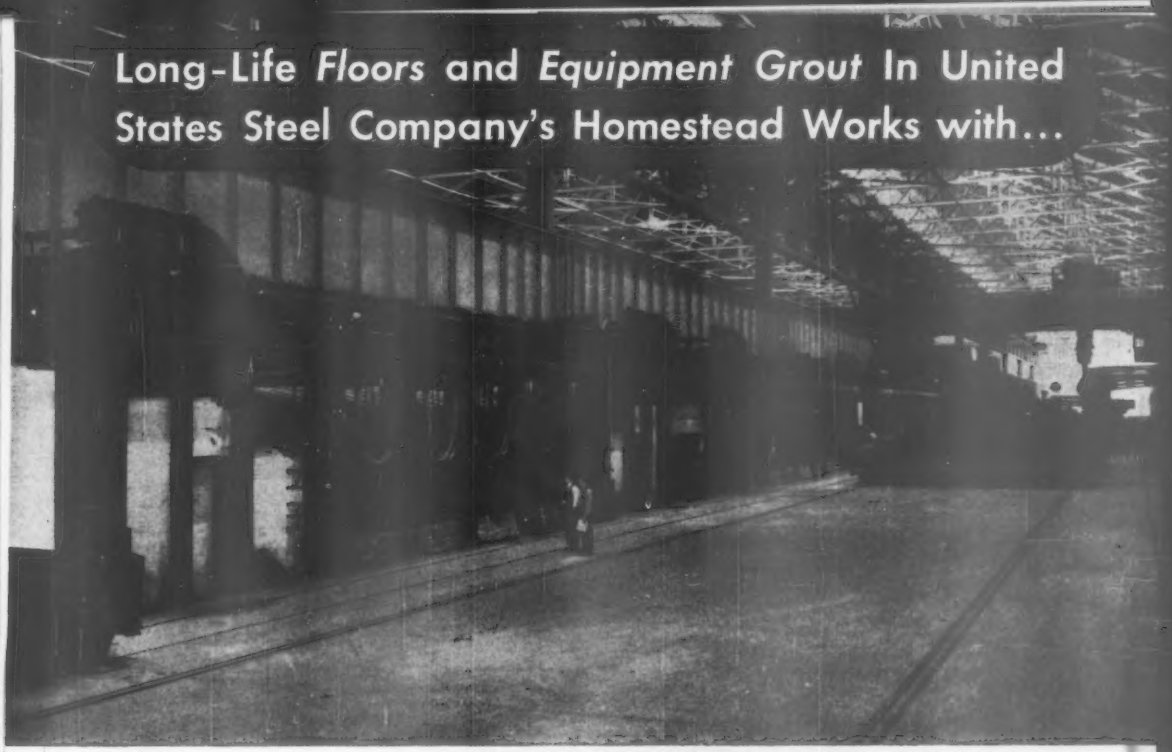
KELLER TOOLS

**KELLER**

*Pneumatic Tools*

KELLER TOOL CO., GRAND HAVEN, MICH.

# Long-Life *Floors* and *Equipment Grout* In United States Steel Company's Homestead Works with...



UNITED STATES STEEL COMPANY, HOMESTEAD, PENNSYLVANIA

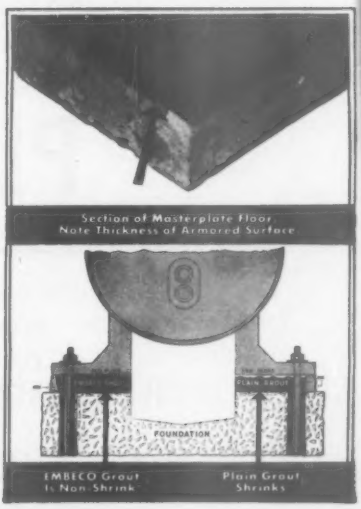
## MASTERPLATE IRON-CLAD CONCRETE FLOORS
## EMBECO Non-Shrink GROUT

**The best evidence of the good performance and long-term economy obtained with Masterplate and Embeco is their repeated use in such leading plants as United States Steel Company's Homestead Works.**

**MASTERPLATE . . .** produces an iron-armored surface about one-eighth inch thick on concrete floors — at time floor is installed. A Masterplate Floor wears 4-6 times longer than the best plain concrete floor . . . is spark resistant, static disseminating, non-dusting, corrosion resistant, easy-to-clean, non-slip, economical. Non-colored and eleven colors.

**EMBECO . . .** counteracts mortar shrinkage — principal cause of failure in equipment grouts. Produces easy placeability, early strength to avoid long, costly shut-downs. Provides complete, level bed-plate contact, plus ductility to withstand impact, vibration and pounding action.

***Full information on Masterplate and Embeco and "see-for-yourself" demonstration kits supplied on request . . . without cost or obligation.***




the MASTER BUILDERS Co.

CLEVELAND 3, OHIO — Subsidiary of American-Marietta Company — TORONTO, ONTARIO

IMMEDIATE DELIVERY FROM STOCK

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We are distributors of:

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*Write for the FREE book "How to Work With Plexiglas."*

15111 SECOND BLVD., Detroit 3, Michigan
Chicago Warehouse: 727 W. Lake Street

# YOU MUSTN'T MISS—

*Begins on page 254*

## No Moving Parts in Sand Dryer

To eliminate excessive equipment wear in handling sand or other abrasive materials, eliminate the moving parts. Easier said than done—but not impossible. It's the principle behind a new type of foundry sand dryer at Worthington Corp., Buffalo.

The installation is part of a $75,000 automatic system for reclaiming up to 5 tons of waste sand per hour for re-use in foundry cores and molding.

**How it works** · The sand, after screening, washing, and preliminary drying, is elevated to the top of a drying tower. It falls through the tower, passing slowly through a series of hot air ducts built in rows through the complete height of the dryer. When it reaches bottom, it's clean and dry.

Hydro-Blast Corp., Chicago, manufactures the system.

## New Plastic With Many Uses

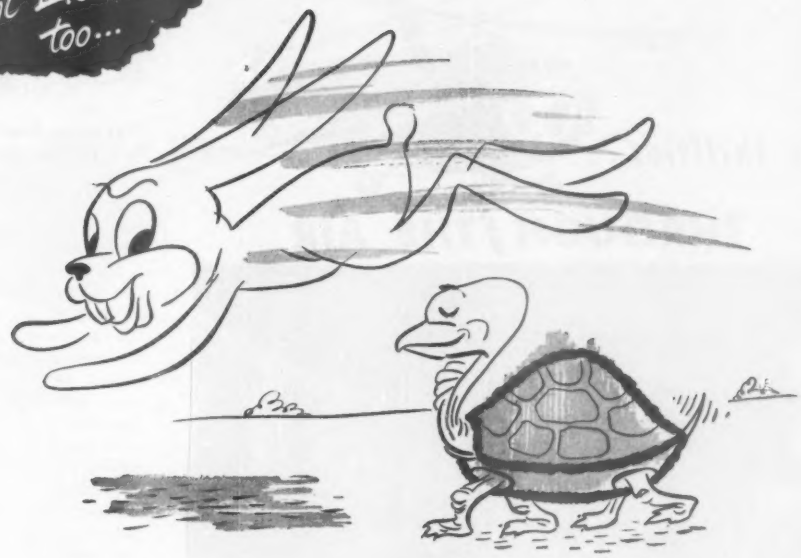
A multi-purpose plastic that you can pour into place, force into cavities, or cast into blocks offers many new applications in production and as a soundproofing and insulating medium.

The foaming, liquid substance is called Lockfoam. It provides Lockheed Aircraft Corp., which developed it, with the answer to the problem of how to give strength and stability to parts with small, odd-shaped structural cavities: Just pour in the foam and it expands to fill the spaces.

Lockfoam can be poured and set under ordinary room conditions without heat or special equipment, Lockheed says. During foaming it sticks without glue to wood, paper, fabrics, metals, and glass fiber, the company adds. And it provides insulation against just about everything.

*Turn the page*

*with Freight Elevators too...*



**SPEED CAN BE DECEIVING**

Jack-Rabbit starts are fine for the track. High cruising speeds are taken for granted in today's automobiles.

And—when planning changes in your freight elevators, speed is an important consideration. But it's only one of *many* factors involved.

To make sure you get the *complete* answer to any vertical transportation problem, ask for the help Westinghouse can give you. For Westinghouse elevator engineers are experienced specialists—at your service without obligation to you. These men are trained to assist you in freight elevator planning, selection and installation.

Westinghouse considers freight elevators an integral part of your materials handling system. The freight elevators you need are determined by such factors as your building's size, permissible floor loads, and type of product or merchandise to be moved. The right number and type of elevators are recommended that will contribute most to the overall efficiency of your materials handling system.

To get a better idea of the important assistance available from Westinghouse elevator engineers, write for the book, "Buyer's Guide for Freight Elevators." This Guide has received wide acceptance among architects and engineers. It will surely put you on the right track in solving your vertical transportation problems.

TUNE IN ON HISTORY! Only Westinghouse brings you complete coverage of four-month political campaign over CBS television and radio.

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*"Buyer's Guide for Freight Elevators." 46 informative pages on design, lifting capacity and size, layouts, etc.*

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Please send me "Buyer's Guide for Freight Elevators" at no obligation.

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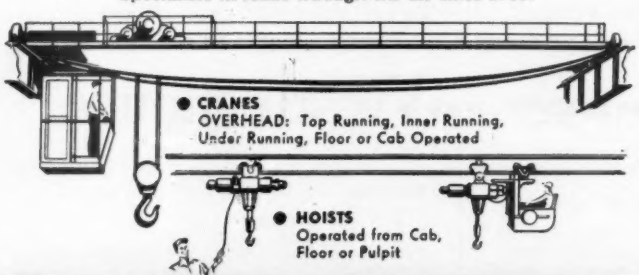
**HERE'S THE THRIFTY WAY** to handle materials — with only two stops from start to finish! Pick up the load at the door with this Shepard Niles Crane, then deposit it where you want it. There's no further handling, no floor space wasted. Instead, you make room for more production and storage.

**IT'S NOT ONLY LESS COSTLY,** it's faster and easier when you handle it through the air. But what crane will suit your plant best? The Shepard Niles representative can give you this answer, based on a careful study of your plant's needs. Send for Bulletins 175 and 176 today — ask to have a representative call.

*Specialists in loads through-the-air since 1903.*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# YOU MUSTN'T MISS—

*Begins on page 254*

## Humans, Not "Brain," Err in Election

"You can't trust these big electronic computers—they're so complicated something's bound to go wrong."

That's a common feeling—and the technicians who operated Remington Rand's giant brain, Univac, on election night fell for it. Hook, line and sinker.

Just before 9 p.m. (E.S.T.), with less than 3-million votes counted, Univac made a prediction: 40 states for General Eisenhower, 8 states for Governor Stevenson.

The technicians and the CBS political analysts agreed that the computer had gone nuts. So the prediction was not put on the air. Instead, the technicians made adjustments in the computer—"told" it to change some of the assumptions on which it was to base predictions.

The result: At 11 p.m., when the Eisenhower sweep was becoming apparent to anyone, Univac was predicting Eisenhower by less than 300 electoral votes—with only an 8-to-7 chance of holding the lead.

So at that late hour, Univac was told to revert to the original instructions. The computer's reply, in effect, was this: "I told you so. Why didn't you believe me in the first place? It's Eisenhower, 40 states, 442 electoral votes."

Official counts in a few close states may cause Univac to "err" by a small margin. But the simple fact of refusing to believe an electronic brain cost CBS and Remington Rand the biggest election scoop in history.

## European Workers Get U. S. Know-How

Two hundred Western European workers are now spending a year's leave of absence in American plants. Their objective: to

# PRODUCT IDENTIFICATION

## plus safe arrival with Gummed Products'

## PRINTED TAPE

Every package will be a prestige advertisement for your goods when neatly, and *safely*, sealed with Sterling Supreme or Trojan Imperial Printed Gummed Tape, containing your name, trademark or selling message. Ultra-modern printing equipment is ready to produce tape for you, like the samples shown here, in quantities of 100 to 10,000, or more rolls, in one or two colors.

So, for package-prestige and trouble-free service get in touch with the Paper Merchant in your community who handles Sterling Supreme, the super-standard gummed tape, or Trojan Imperial, the standard gummed tape.

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"perfection in plastics"
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# Ruggedly Safe

—to do any jacking job better!

# SIMPLEX JACKS

**Re-Mo-Trol HYDRAULIC PULLERS**
(PUMPS AND REMOTE CONTROLLED RAMS)
10 to 100 ton capacities

**UNIQUE "CENTER-HOLE"*** minimizes rigging and set-up—provides more effective power.

Simplifies tough pulling jobs! Pull rod or screw is drawn *through* ram plunger in straight, torque-free pull. Ram is own backup. Also lifts or presses.

*"Center-Hole" in rams of 30 ton and greater capacities.

**RATCHET LOWERING JACKS**
Lift or lower the load notch by notch. Cannot be tripped. *Toe* has *same capacity* as cap! High lift with minimum clearance means less set-up, less blocking. Single or double acting. 1½ to 20 ton capacities.

**HYDRAULIC JACKS**
Fast, easy power! Operate vertically or horizontally with same efficiency. Tested to 50% over rated capacity. Single or double pump models; 3 to 100 ton capacities.

**SCREW JACKS**
Cap floating on single chrome-moly ball reduces friction 88%. Forged cap corrugated for safety. Malleable iron base flared for stability. Four-way or ratchet heads. 10 to 24 ton capacities.

**Other SIMPLEX JACKS include:**
Simplex-Jenny Hydraulic Pullers
Push and Pull Jacks and Accessories
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LEVER • SCREW • HYDRAULIC
Jacks

TEMPLETON, KENLY & CO. 1018 South Central Avenue, Chicago 44, Illinois


## YOU MUSTN'T MISS—

*Begins on page 254*

pass on what they learn about production over here to their co-workers when they return.

The program is operated by the Mutual Security Agency under a $20-million Marshall Plan grant. By the time the money has run out, 2000 foreign workers will have participated.

Companies in Austria, France, Italy, Norway, and Switzerland have sent employees. Switzerland, not a Marshall Plan country, foots the bill for its workers without U. S. aid.

Provisions is made for the men to live with fellow employees where possible so they can learn the customs, habits, and qualities of the American home as well as the American industrial plant.

### Suggestion System for Patents

Cash and competition have combined to boost the output of new ideas at Westinghouse Electric Corp.

The company credits an invention award plan with most of an 80% increase in patent disclosures filed by its employees. During the seven months it has been in effect, the plan has paid out approximately $95,000 for ideas with commercial potential.

Basis of the system is four types of cash awards for patentable ideas and a quota system that adds the competitive factor.

The four awards range from $25 for a patent disclosure to $5000 for an invention that has proved of outstanding commercial value to the company.

The suggestion quota system—a target assigned to each engineering department—has been responsible for drawing more inventors into the plan, the company says. Even non-technical people are contributing. They turn in about 5% of the new ideas.

*Turn the page*

# See how Norton New-Process Wheels bring new efficiency... new economy... to your toolroom grinding

Norton *New-Process* Wheels Are Truly Uniform Within Themselves And From Wheel to Wheel . . . Unmatched For Inherent Balance And Grinding Efficiency.

## You get:

**IMPROVED GRINDING OPERATION.** More uniform wheel-structure assures even wear . . . fewer machine adjustments . . . longer service life . . . identical top performance from identically marked wheels.

**IMPROVED RESULTS.** Built-in balance reduces vibration . . . eliminates chatter marks . . . permits closer tolerances and smoother finishes . . . and lasts as long as the wheel.

**IMPROVED TOOL MAINTENANCE.** You can take heavier cuts on expensive tool steels without drawing tempers or risking spoilage. Tools stay sharp longer . . . last longer . . . with fewer trips back to the crib.

**AVAILABLE IN A RANGE OF ALUNDUM® ABRASIVE TYPES**

*New-Process* Wheels are made in sizes up to 14″ diameter in the various types of ALUNDUM (aluminum oxide) abrasive — Regular ALUNDUM, 19 ALUNDUM, the new and outstanding 32 ALUNDUM, 38 ALUNDUM and 57 ALUNDUM. These fast-cutting, cool-cutting abrasives are ideal not only for the complete range of toolroom grinding but for many other jobs on materials of high tensile strength.

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Here's a man who knows which type and size of wheel is best for each grinding job. And if your problems are unusual, he'll call in a Norton Abrasive Engineer for additional expert advice. See your Norton Distributor for the *right* Norton Wheel for *any* grinding application.

**162 Pages Of Cost-Saving Facts** on toolroom grinding are contained in this booklet. Get a copy from your Norton Distributor, or write direct for Form 833.

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—to do any jacking job better!

# SIMPLEX JACKS

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*Begins on page 254*

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**YOUR NORTON DISTRIBUTOR CAN SAVE YOU TIME AND MONEY**

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# HYDEE HANGER*

## REDUCES INSTALLATION TIME

**EASY, LOW-COST WAY TO HANG CHAIN-SUSPENDED FIXTURES**

1. Connect wires to receptacle. Fits standard 4" or 3¼" outlet box or plaster ring.

2. Screw hanger to outlet box—only two screws needed. No centering, no punching, no drilling. Screwdriver only tool needed.

3. Hang the fixture and plug it in. That's all! Self-grounding—regular 2-wire cord and plug may be used.

**Hydee Hanger, complete with receptacle, two 3-ft. chains, "S" hooks and clips—**

"DECIDEDLY BETTER"
**DAY-BRITE**
*Lighting Fixtures*

*Patent No. D-141024 and No. 440914. Underwriters approved. T. M. Reg. U. S. Pat. Off.

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More and more, day after day, Hertner Electric is being called on to design and build special equipment for special battery-charging jobs . . . for electric trucks, motorized hand trucks, mine locomotives, railroads, telephone exchanges . . . wherever battery-charging equipment is required.

Illustrated here is a special-built, 4-circuit, unitized switchboard for charging four separate batteries simultaneously. Of these four batteries any can be one of six different types. This man-hour saver and space-saving charger is equipped with a motor generator with a capacity for four additional circuits, ready for future expansion.

Our staff of experienced engineers and modern production facilities are available to produce custom-built motors and generators to meet your exact requirements. *Standard model Hertner battery chargers are available for immediate shipment.* For complete information consult your electric truck or Hertner representative, or write direct.

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*A General Precision Equipment Corporation Subsidiary*
MOTORS • MOTOR-GENERATORS • GENERATOR SETS


# YOU MUSTN'T MISS—

*Begins on page 254*

## TIMELY HINTS

### Community Relations Gets Early Start

Why wait until your new plant is built before thinking about good community relations? U. S. Steel Corp., a smart practitioner of the art (FACTORY, February 1952, page 222) began its program long before actual construction work started on the new Fairless Works, Morrisville, Pa.

The press, schools, and local organizations got—and welcomed—plenty of information in speech and print about the plant. And after construction began, the company inaugurated Sunday bus tours of the project, and invited for week-day guided tours many organized groups of students, clergy, and service clubs.

### How to Make Wage Comparisons

Don't use average community wage rates if you want to figure how your company stands wage-wise. Use instead a job-for-job, an industry, or a company-size basis.

That warning comes from Associated Industries of Cleveland in a recent wage settlement survey. Here's just one telling bit of evidence:

AIC figured the average (arithmetic) hourly wage for a UAW-CIO worker in Cleveland at $1.805 per hour, regardless of plant size. But when it figured the average (arithmetic) hourly wage of the same union's contracts for only those companies employing 200 persons or fewer, the average dropped to $1.687. Difference: almost 12¢ per hour.

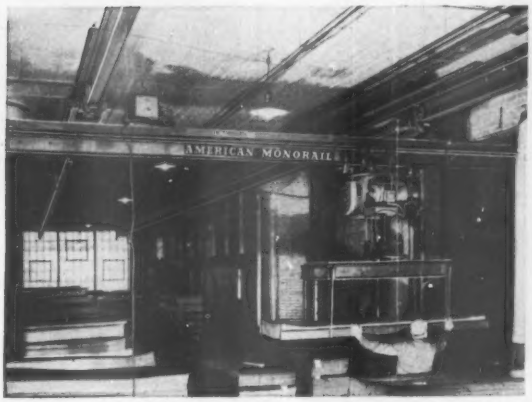
*Turn the page*

# AMERICAN MONORAIL

- **INCREASES PLANT CAPACITY AND PRODUCTION**
- **REDUCES HANDLING COSTS, DAMAGE AND LOSS**

American MonoRail Engineers can show you how to get more profitable production out of your plant by systematizing material handling. Let them show you how to convert lost ceiling space to profit—how to eliminate obstructive storage around machines—lessen worker fatigue—reduce heavy load accidents—stop damage to product in motion.

Bring us your handling problems—American MonoRail can provide the equipment best suited to your needs.

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**A 56 page book showing how American MonoRail Engineers have successfully solved other companies' handling problems.**

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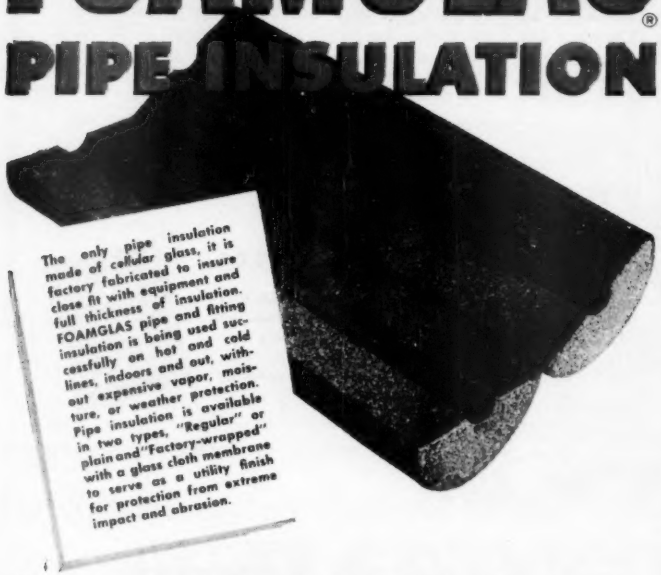
# THIS IS FOAMGLAS® PIPE INSULATION



The only pipe insulation made of cellular glass, it is factory fabricated to insure close fit with equipment and full thickness of insulation. FOAMGLAS pipe and fitting insulation is being used successfully on hot and cold lines, indoors and out, without expensive vapor, moisture, or weather protection. Pipe insulation is available in two types, "Regular" or plain and "Factory-wrapped" with a glass cloth membrane to serve as a utility finish for protection from extreme impact and abrasion.

## There is no other insulation like it . . . Here's why:

**FOAMGLAS** is not a fiber, a batt, a blanket, wool or board. It contains no granular or organic material. It is composed entirely of still air sealed in millions of minute glass cells.

**FOAMGLAS** eliminates the need for extra moisture and vapor barriers. It is practically impervious to fumes, chemicals and other elements, therefore *retains* its original insulating efficiency throughout exceptionally long service.

**FOAMGLAS** is an effective barrier to heat flow. It helps maintain predetermined temperatures. It is being used successfully in many and varied high and low temperature applications on pipe lines and process equipment.

**FOAMGLAS** is light, strong, rigid, durable. It cannot burn. Insects and vermin cannot nest in it, eat into or through it. FOAMGLAS needs no special type weatherproofing when used outdoors.

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Please send me without obligation a sample of FOAMGLAS and your FREE booklets on the use of FOAMGLAS for: Normal Temperature Commercial, Industrial and Public Buildings ☐ Refrigerated Structures ☐ Piping and Process Equipment ☐.

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PITTSBURGH CORNING CORPORATION · PITTSBURGH 22, PA.


## YOU MUSTN'T MISS—

*Begins on page 254*

**TEST DIGGING,** pinpointed from information in photo, reveals piling as . . .

### Progress Photo Saves $1-Million

Photographs taken at various stages while your new plant is under construction can do more than show how the job's progressing. They're perfect "X-Rays" of your building's innards that you can use for reference. (FACTORY, February 1952, page 84).

Chrysler Corp. dramatically reproved the point recently when it turned an old progress photograph into a $1-million dividend at Michaud Ordnance Plant, New Orleans.

**How it happened** · J. G. Carter, plant engineer, was rummaging through a neglected file cabinet when he found the picture. It revealed that the ground underneath his building had already been prepared with 40,000 piles during World War II for a shipyard that was never built.

A little digging under the concrete floor for tangible evidence soon proved that photographs hadn't lied. By changing the layout of machine lines, the company was able to spot heavy production machinery so as to utilize the pile foundation. Saving: $1-million.

*Turn the page*

# What to look for in a safety switch

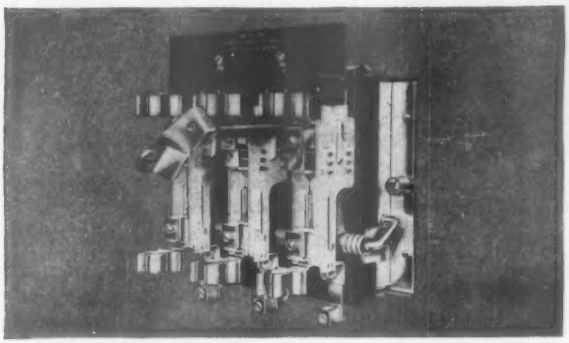
- **Maximum protection for electric circuits and personnel**
- **Ease and flexibility of installation**
- **Convenient and safe maintenance**

A modern, top quality, heavy-duty industrial safety switch *should* fulfill these requirements . . . but what are the design and construction features that make certain that it *will?*

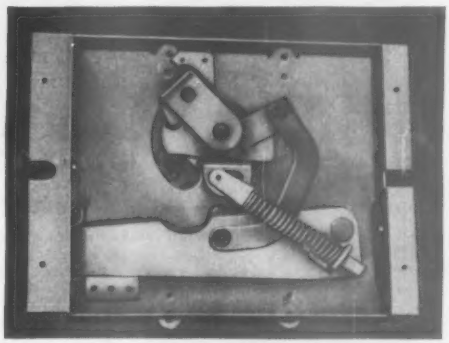
Let's take a close look at the front-operated HCI switch*—Trumbull's best—and check its features point by point.

**Meets NEMA types 1 and 1A specifications.*

**1. START ON THE OUTSIDE—*THE ENCLOSURE.*** Made of heavy gauge steel, specially treated and then coated with high-baked enamel for corrosion resistance. That *handle* is important, too. It has a releasable interlock for use of authorized inspectors only and will take three padlocks. The *cover latch* may be locked independent of the handle so the switch can be operated but not tampered with. The front is provided with a gasket, making the enclosure semi-dust-tight. Inside there's ample room for wiring—and plenty of *knockouts.* Three mounting holes make possible easy leveling and allow mounting on uneven surfaces.



**2. REMOVE THE *INTERIOR UNIT.*** Just loosen two screws and the whole interior slips out. The *pole units* are self-contained for easy removal without disconnecting wiring and use *silver-plated current-carrying parts . . . arc-resisting, linen-melamine insulating parts.* U-shaped *movable conductors* bring gap between line and load contacts to less than ½ inch reducing possibility of arc damage. Exclusive design of *pole units* and *contacts* take advantage of magnetic repulsion principle to give maximum arc-quench and contact bind (look further into this feature; it's the key to the long life expectancy of the Trumbull HCI).



**3. BE SURE TO STUDY *OPERATING MECHANISM.*** Underside of the HCI interior shows this operating mechanism which is protected by a riveted *cover plate.* It uses a *roller-cam action* and a multiplying *linkage* design with a powerful *spring* that always throws to full OFF or ON. No halfway position because there's no dead center.

***Write for full data on Trumbull top quality, heavy-duty industrial safety-switch line—the HCI. Ask for Bulletin TEC-10.***

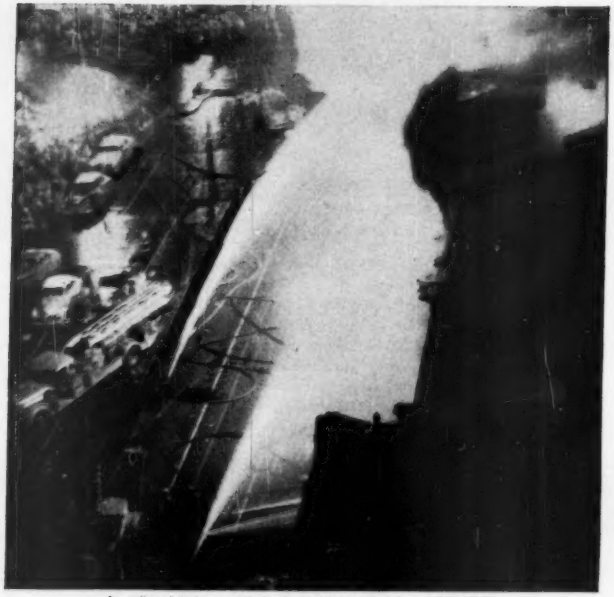
**TRUMBULL ELECTRIC**

**DEPARTMENT OF GENERAL ELECTRIC COMPANY**

**PLAINVILLE, CONN.**

Pyrene
REG U.S. PAT. OFF.

**A PYRENE WON'T STOP CARELESSNESS—**
**IT WILL KILL FIRES!**

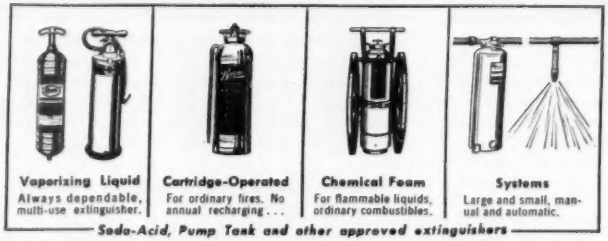


A cardboard locker caught fire in the basement and soon this whole Dayton, Ohio, building was ablaze. Date: January 6, 1950. Loss: $291,500.

**There's a Pyrene for every fire hazard**

The right extinguisher at the right time can often prevent enormous losses. Whatever your fire hazard, there's a Pyrene* to cope with it—for Pyrene makes everything from hand extinguishers to complete automatic fire-fighting systems.

*T.M. Reg. U.S. Pat. Off.



**Vaporizing Liquid** — Always dependable, multi-use extinguisher.

**Cartridge-Operated** — For ordinary fires. No annual recharging . . .

**Chemical Foam** — For flammable liquids, ordinary combustibles.

**Systems** — Large and small, manual and automatic.

*Soda-Acid, Pump Tank and other approved extinguishers*

**PYRENE MANUFACTURING COMPANY**
**690 Belmont Avenue Newark 8, New Jersey**
Affiliated with C-O-Two Fire Equipment Co.

# YOU MUSTN'T MISS—

*Begins on page 254*

## Safer Plant With Safety Veto

Management often does a lot of talking about its interest in safety, but it doesn't always show it means business by backing up the recommendations of plant safety experts. So Davison Chemical Co., determined to make its safety program work, gave veto power to the safety man.

Plans for new plants, processes, new methods, equipment, structures, and alterations are given close scrutiny by the safety people. If they find health or accident hazards, they can send the plans right back to the initiating department for further study and work. They can even hold up projects that are the responsibilities of top management.

Best way to point up the results you get with this kind of safety engineering is to look at Davison's record: In 1950 it won 35 safety awards from four organizations. Among them was the National Safety Council's Distinguished Service to Safety Award, granted Davison as a whole.

## Small Plant Aids Offered Free

If yours is a small plant, you might take advantage of the free management and technical aid service offered by Small Defense Plants Administration. It comes in the form of weekly bulletins, one on technical problems, one on management problems.

Up to now, more than a dozen bulletins in each category have been issued on such subjects as "How Small Plants Can Sell to the Federal Government," and "Cutting Oils and Coolants."

You can get on the mailing list by writing SDPA, Washington 25. Ask for *Technical Aids for Small Business* or *Management Aids for Small Business*. Or both.

*Turn the page*

# The Quick, Economical solution to **Heating Gases** and **Process Air**

## CHROMALOX Electric Heaters

CHROMALOX offers you a wide variety of electric heaters to fit the temperature requirements of your jobs and the physical dimensions of your equipment. CHROMALOX Units are the dependable, efficient answer to heating recirculating ovens. They quickly and simply convert air-conditioning systems to central heating systems. Units are available for heat treating ovens, annealing ovens, core and armature drying ovens and similar applications. Operating temperatures up to 1000° F. are easily achieved and accurately maintained by thermostat control. Standard units are quickly installed in existing ducts and multiple circuits can be supplied for modulating the heat output.

CHROMALOX

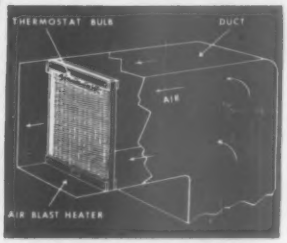
*Electric Heat for Modern Industry*

IC-57

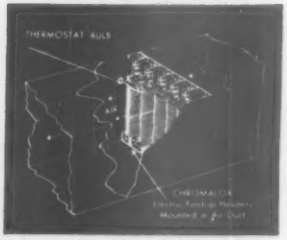
**CHROMALOX**

*dependable, efficient*

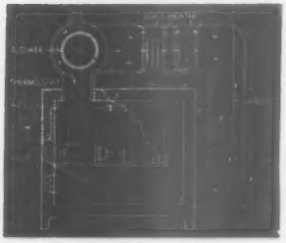
# HEAT




(A) AIR BLAST HEATER slides into duct for heating air under forced circulation. Two or more heaters may be mounted in same duct. Built-in bus-bar easily connected for single or multiple-circuit control.




(B) FINSTRIP HEATER for drying, curing, space heating and other applications requiring heat under forced circulation. Heat is quickly dissipated by parallel-fin construction with minimum air-friction loss. Flanges simplify mounting.



(C) DUCT HEATER mounted in recirculation oven for temperatures from 400° to 1000° F. Multi-circuit units allow varying heat outputs.

## Want more Know-How?

Send for Catalog 50 and the useful booklet of application ideas "100 Ways to Apply Electric Heat". They are both yours without obligation.

Industrial Heating Division
EDWIN L. WIEGAND COMPANY
7518 Thomas Blvd., Pittsburgh, Pa.

AT YOUR SERVICE

# 2 NEW Shenango bulletins

**. . . on symmetrical or annular parts, ferrous and non-ferrous**

IF your plans call for bushings, liners, sleeves, rings, rolls, or *any* essentially symmetrical shape, find out about the many advantages you stand to gain with Shenango centrifugally cast parts.

**BULLETIN NO. 150** covers non-ferrous parts in manganese and aluminum bronzes, red bronzes, brass, Monel Metal and special alloys.

**BULLETIN NO. 151** covers parts of Meehanite Metal, Ni-Resist and special iron alloys.

These new bulletins show typical Shenango produced parts that are saving time, trouble and cost in industries everywhere. Get the facts. Either or both bulletins are yours for the asking.

**SHENANGO-PENN MOLD COMPANY**
Centrifugal Castings Division
**Dover, Ohio**
*Executive Offices: Pittsburgh, Pa.*

**SHENANGO**
ALL RED BRONZES · MANGANESE BRONZES · ALUMINUM BRONZES
MONEL METAL · NI-RESIST · MEEHANITE METAL


# YOU MUSTN'T MISS—

*Begins on page 254*

## Checklist for Skill Improvement

Doing all you can to make your skill improvement program work? Better check the following list to make sure you provide . . .

. . . a staffing schedule to show by skill categories the number of workers you'll need to meet production schedules.

. . . one person, who has top-level support, with full responsibility for training.

. . . a training program for additional supervisors you may need.

. . . one or more workers qualified as job instructors.

. . . enough apprentices under training to meet your long-range need for skilled workers.

. . . an inventory of the skills of your employees to help in utilizing them fully.

. . . an organized program for training new men on the job.

. . . an organized program to improve on the job the skills of employees otherwise qualified to advance.

. . . a request that your local vocational school assist your program where it can.

. . . encouragement to your employees to take outside courses to aid them in qualifying for advanced jobs.

. . . arrangements for your employees to help solve your manpower problems through some device of their own choosing.

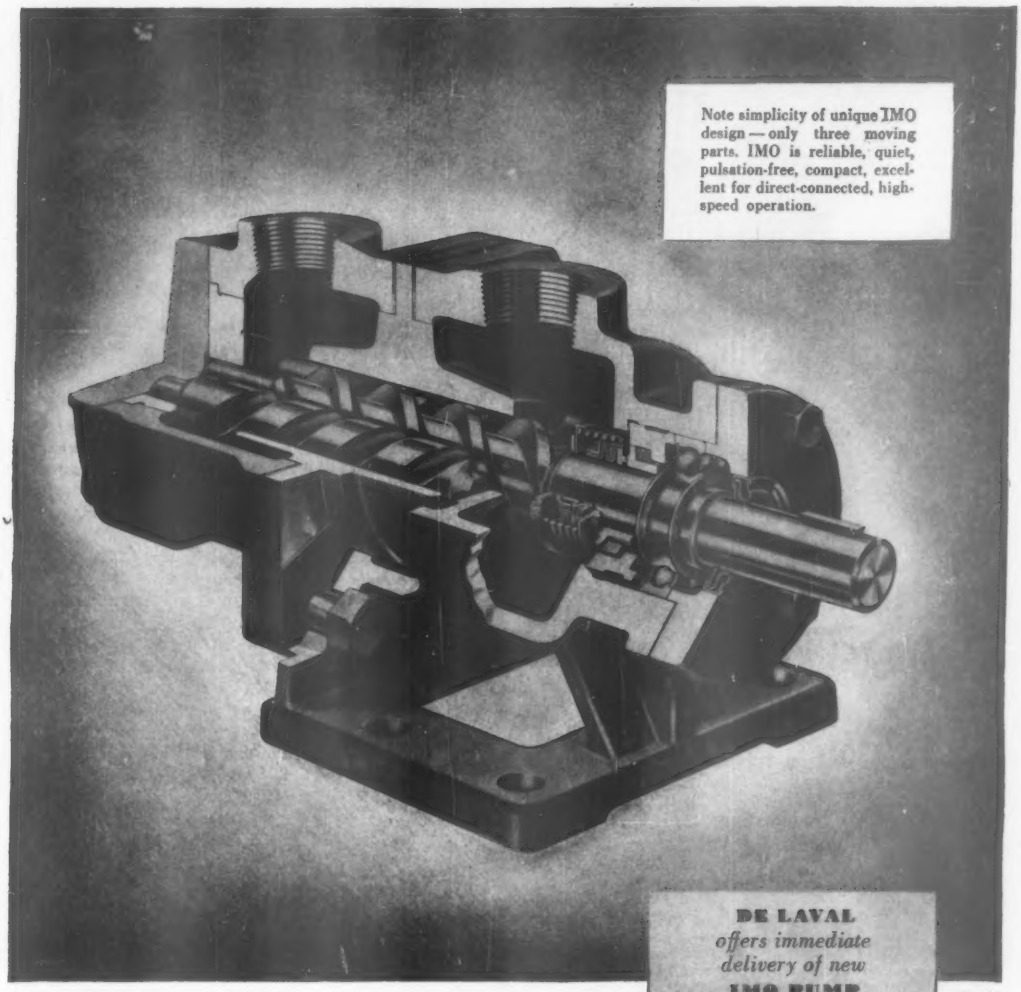
. . . an analysis of each job for which training is to be given, to determine what skill training is needed and what related information trainees will need.

. . . a training program using all possible means to encourage safe work practices.

The checklist appeared in a Bureau of Apprenticeship booklet entitled "Your Skill-Improvement Program."

*Turn the page*

# *Newest IMO pump – Greatest savings*



Note simplicity of unique IMO design — only three moving parts. IMO is reliable, quiet, pulsation-free, compact, excellent for direct-connected, high-speed operation.

**DE LAVAL**
*offers immediate delivery of new*
**IMO PUMP**
*Write today*

DL 147

This newest De Laval IMO pump — Model A313B — can be used profitably on a wide variety of hydraulic applications for higher pressures. Quantity-produced to help trim your costs, the new IMO saves you up to 40% in initial cost over other IMO models for pressures up to 275 psi. In addition, this quality-designed rotary positive displacement pump gives you all the low-maintenance advantages of the famous IMO pumping principle.

Put the new De Laval IMO A313B pump to work handling light or viscous fluids in hydraulic systems, rotary and steam atomizing oil burners, lubrication, governing systems and similar services. Specify it for capacities to 80 gpm, pressures to 275 psi and intermittent pressures to 325 psi.

**DE LAVAL** *IMO Pumps*

DE LAVAL STEAM TURBINE COMPANY
*804 Nottingham Way, Trenton 2, New Jersey*

REGISTER NOW FOR THE

4th Plant Maintenance Show and Conference

Cleveland

January 19-22, 1953

**REMEMBER** . . . it's the show for presidents, vice presidents, general managers, plant managers, plant engineers, maintenance engineers – and all other plant operating men whose responsibility it is to select, install, operate, and maintain the plant equipment and services that mean low-cost operation and high production.

**AT THE SHOW** . . . in one place, at one time, for your first-hand inspection and comparison – *more than 350 exhibitors of the machines, equipment, and services you need to maintain your plant at top operating efficiency.*

**AT THE CONFERENCE** . . . you'll meet maintenance specialists . . . you'll talk shop, in small group meetings, with men from other plants and other industries who have faced the same problems you face – and have learned how to solve them.

For free show tickets for yourself and members of your organization, write today to

CLAPP & POLIAK, *Show Management*
341 Madison Avenue, New York 17, N. Y.

# YOU MUSTN'T MISS—

*Begins on page 254*

**OLD-AGE HOME** for worn-out machinery is part of paper mill's answer to problem:

## How to Care for Displaced Machines

Don't dump discarded machinery and equipment haphazardly around the plant. That's how you throw away the many cash dividends you get from a good salvage program (FACTORY, August 1952, page 106).

Minnesota & Ontario Paper Co. is centralizing and putting a roof over all formerly open-air salvage operations at its International Falls, Minn., mill. And it's assigning a regular crew to remove, recondition, and store all usable machinery.

Here are the advantages of the program, says the company:

- **It saves time in locating discarded equipment.** Formerly a workman had to search the salvage yard for a particular discarded piece of equipment. In winter he often had to dig through several feet of snow to find what he wanted. That's all over now. The new salvage building will house all the salvaged equipment and parts in good order, with a complete inventory of machinery and equipment available.
- **It cuts reclamation costs.** When material was left outside it often rusted, resulting in high costs for again reclaiming it.
- **It frees valuable storage space within the mill.** With a special building for storage of displaced machinery, there's no need to use paper and lap storage space.

*Turn the page*

Century Motors are designed for stamina, engineered for long, dependable service, carefully tested and balanced for precision performance.

What's more, you can select a size and type of Century Motor that's exactly right for your particular job. They're built in sizes from ⅛ to 400 h.p.—to meet all kinds of atmospheric or plant operating conditions.

Why settle for less than a Century, when you specify your next electric motor?

Century C Motors

CENTURY ELECTRIC COMPANY
1806 PINE STREET • ST. LOUIS 3, MISSOURI

CE-754

OFFICES AND STOCK POINTS IN PRINCIPAL CITIES

want FREE ADVICE that'll save you money?

Your Cambridge Field Engineer can show you how woven wire conveyor belts combine movement with processing to reduce handling costs, boost output.

Whatever the size or type of product you process . . . regardless of hot, cold or corrosive processing . . . the correct Cambridge Woven Wire Conveyor Belt installation to combine movement with processing means less manual handling, lower handling costs, faster, more uniform production.

Cambridge wire belts can be woven from any metal or alloy . . . including corrosion-resistant alloys . . . to any mesh or weave. If needed, we can provide special side or surface attachments to hold the parts during up or down movement. In processing involving liquids . . . quenching, painting, pickling, etc. . . . open mesh of the belt permits free drainage of process solutions. Where heat or gas atmospheres are used, open mesh permits free, uniform circulation of the process media.

This typical Cambridge belt installation moves galvanized sheet from the pot through cooling and finishing.

**It costs you nothing to get the experienced advice of your Cambridge representative. Why not call him in soon. See "Belting-Mechanical" in your classified telephone directory or write direct for the name of our man who serves your area.**

**130 PAGE ILLUSTRATED CATALOG — FREE!** Gives Cambridge belt design and conveyor construction, also complete belt specifications and metallurgical data. Write now.

**The Cambridge Wire Cloth Co.**

Dept. E • Cambridge 12, Md.

WIRE CLOTH · METAL CONVEYOR BELTS · SPECIAL METAL FABRICATIONS

OFFICES IN PRINCIPAL INDUSTRIAL CITIES

# YOU MUSTN'T MISS—

*Begins on page 254*

## QUOTES

### Why We Have a 40-Hour Week

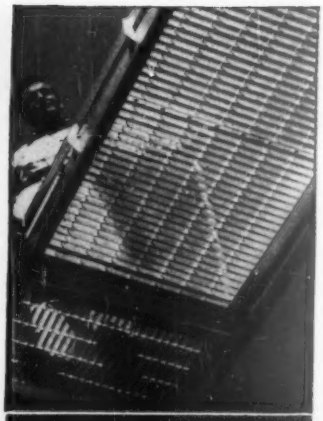
"Our technology has developed tools that enable men to produce so much more wealth than they can with their hands that 40 hours a week is enough.

"A 40-hour week in Red China, though, would be a grim joke, because the average Chinese would die of starvation if he didn't work longer than that. He lacks the tools with which to produce enough to make a 40-hour week possible. And if we in the United States let our technology fail to keep up with our expanding needs, then we'll have no 40-hour week either. Instead, we'll work as long as we have to, to survive, whether it be 60, 80, or 100 hours a week."—*William H. Ward, Vice-President, E. I. du Pont de Nemours & Co., Inc.*

### "People want to be told . . .

". . . how their business is managed. They want to know the reasons for decisions that are made, particularly decisions that directly affect them. This is true for people at all levels of the organization. They want to know what methods are used in wage and salary administration. They want to know whether their business is prosperous and successful. They want to know about their own jobs, how they are making out in them, and what their future in those jobs is. Why? Because it directly affects their own welfare."—*R. K. Honaman, Director of Publications, Bell Telephone Laboratories.*

*Turn the page*



INDUSTRIAL ACCIDENTS COST MONEY

**A.O.Smith 100% SERRATED SAFETY GRATING keeps a man on his feet**

and

**COSTS NO MORE**

than ordinary grating

**PREMIUM QUALITY AT NO PREMIUM IN PRICE!**

Write for our new grating engineering handbook.

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CORPORATION

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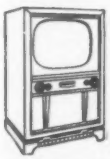
Milwaukee 1, Wisconsin
Chicago 4 • Houston 2 • Los Angeles 22 • New York 17
International Division: P.O. Box 2023, Milwaukee 1

# Philco Famous for Quality the World Over

# Cuts costs with Yale Electric Trucks

## Famous for Quality in Materials Handling Equipment



What business are *you* in? Food-processing, motor freight-terminal operation, textiles, lumber, tool-making? Whatever it is—you *must* move materials from one point to another.

How many men do you employ? Ten—or ten thousand? Regardless of the number, efficient, economical handling of your materials is more important today than ever before.

*It may mean the actual difference between profit and loss!*

**YALE MATERIALS HANDLING EQUIPMENT...** is accounting for 50 to 75% savings in many businesses today—businesses that never realize how costly their old-fashioned handling methods were. Yale is the world's leading manufacturer of materials handling equipment. You can depend on Yale—to give expert attention to your specific handling needs.

**YALE**

**MATERIALS HANDLING EQUIPMENT**

**Yale Electric Hydraulic fork trucks gave Philco—world-leader in electronic equipment—this 3-way saving...**

- **MONEY SAVED!** Knocked the bottom out of handling costs in plant, warehouse and at shipping points.
- **LABOR SAVED!** The change-over from manual handling methods to mechanized Yale equipment greatly increased manpower's effectiveness—released extra men for more important productive work.
- **TIME SAVED!** Boosted parts handling, cut assembly time, spurred shipping operations, and eliminated many bottle-necks at times when increased production was absolutely essential!

**MAIL THIS COUPON TODAY**

**The YALE & TOWNE Manufacturing Co., Dept. 312**
**Roosevelt Blvd. & Haldeman Ave., Philadelphia 15, Pa.**

I want to know how Yale Materials Handling Equipment can help me.

- ☐ Please have your local Representative call.
- ☐ Please send free copy of THE PICTURE STORY OF YALE MATERIALS HANDLING EQUIPMENT.

Company_____

Name_____ Title_____

Street_____ City_____ State_____

*In Canada write:* The Yale & Towne Manufacturing Company
Box 337—Postal Station "A"—Toronto

*YALE is a registered trade mark of The Yale & Towne Manufacturing Co.*

**YALE GAS AND ELECTRIC INDUSTRIAL TRUCKS • YALE WORKSAVERS • YALE HAND TRUCKS • YALE HAND AND ELECTRIC HOISTS • YALE PUL-LIFTS**

When you have a taping problem

—ask your Orange Core dealer

***Your Orange Core Gummed Tape dealer is an expert on the sealing of cartons and parcels; his help to you is free.***

**"Service"** is the first name of your Orange Core Gummed Tape dealer. He can give you the counsel you need—not only on the sealing of cartons and parcels—but on many paper problems in general. If he doesn't have the facts you want, he'll get them for you. Good will is the foundation of his business success.

**Service** is his yardstick for the paper lines he sells, too—lines that give you *more service* for the money. Typical is Orange Core gummed sealing tape. This brand is unexcelled by any other standard tape for uniformity and dependability—because it is made from tree to finished product under *one* roof. As a bonus it offers you the exclusive Hudson feature—*Supple-izing**—preventing tendency to stiffness and curl.

**Service** is prompt with your Orange Core dealer. Patronize him for *all* your paper needs.

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"The world's largest selling gummed tape"

ORANGE CORE

GUMMED SEALING TAPE

Available plain or printed, in choice of widths, weights, lengths, and colors

HUDSON PULP & PAPER CORP., Dept. 44, 505 Park Ave., New York 22

# YOU MUSTN'T MISS—

*Begins on page 254*

## Management People Must Be Tops

"Our plans for the choice of management men must be just as careful, just as systematic, as those for the design of our new products, the schedule of our production, the extent of the facilities we will need. . . .

"The business executives, whoever they may be, who will be called upon to meet and solve problems like these will have to be men of stature. We cannot choose them by chance or by prayer only. The most important job that American industry and the American universities have is to work together to educate these men, select them scientifically, train and test them fully, and give them every possible advantage in the work they will do for human society." — *Gwilym A. Price, President, Westinghouse Electric Corp.*

## Plea for Economic Education

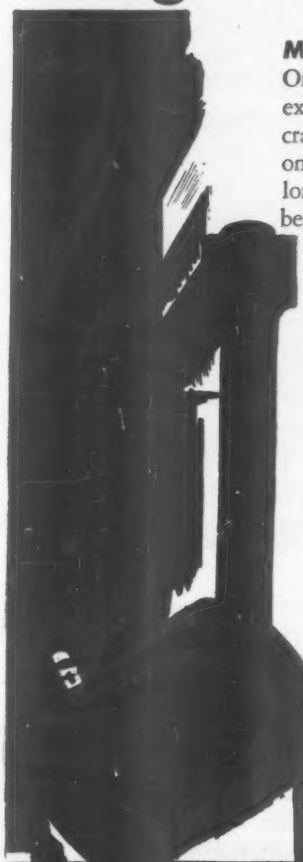
"Too many of us just do not understand how we got this standard of living that's the envy of the rest of the world. We don't realize the peril it's in, and we are not equipped to defend it.

"Too many of us working, and buying, and voting adults just don't understand the separate and useful parts played by the customer, the worker, the manager, as well as the saver—that each of these has a necessary part to play, but that not one of them can play it, or will even try, unless the incentive is there, unless he thinks he is going to get what's right . . . for what he does.

"We adults have to go back to school, for our problem is primarily that of economic education—of the mathematics of our way of life—of the simple arithmetic of freedom."—*L. R. Boulware, Vice President, General Electric Co.*

Steel executive reports:

# "Bearing life has increased one to two years since using UNOBA grease."



**M. E. Haldeman** of Columbia Steel Casting Co., Inc., Portland, Ore., writes: "In August, 1946, we started using UNOBA grease exclusively in all of our equipment. Since using UNOBA on our cranes, the bearing life of the bridge truck journals has increased one to two years. The ability of the grease to stick has greatly prolonged the service of trunnion roller bearings and muller wheel bearings."

**1.** UNOBA differs from conventional factory lubricants because it is made with a *barium* base. This base gives UNOBA exceptional heatproof and waterproof qualities.

**2.** In addition to these qualities, UNOBA has unusual adhesiveness to metal and maintains excellent grease structure under severe operating conditions.

**3.** This unique combination of properties qualifies UNOBA as a *multi-purpose* grease. This one grease does the jobs which previously required *many* different types and grades.

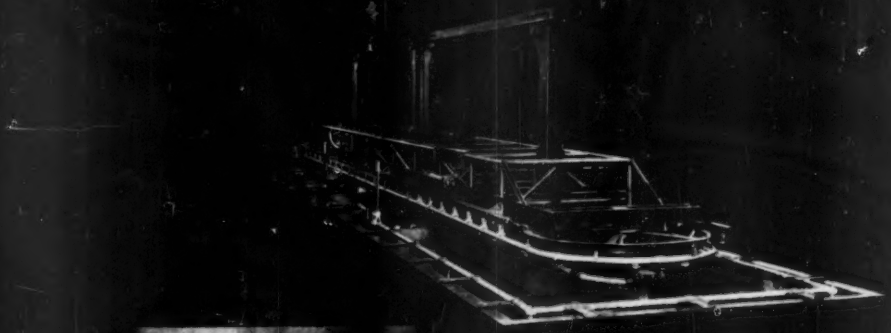
***Your nearest Union Oil Company office will furnish full information and arrange for the delivery of a trial supply of UNOBA. Write today!***

OFFICES

LOS ANGELES, Union Oil Bldg. — NEW YORK, 4904 RCA Bldg.
CHICAGO, 1612 Bankers Bldg. — CINCINNATI, 2111 Carew Tower Bldg.
NEW ORLEANS, 917 National Bank of Commerce Bldg.

**UNION OIL COMPANY** 76
**OF CALIFORNIA**

# THE *Udylite* MACHINE BEHIND THE SHELL!



## International Register Chooses Udylite . . . lowers costs . . . plates fuse assemblies better!

International Register of Chicago chose Udylite equipment to provide a tough, durable finish for vital fuse parts.

With Udylite equipment they're sure that finished fuse assemblies contain no rack marks or shadows. A special lift, which is part of the Udylite rack conveyor, raises racks clear of the plating solution so they may be easily turned.

Further proof of the effectiveness of Udylite processes and equipment is found in the fact that five other companies have ordered the same equipment to meet their requirements for similar jobs.

Udylite equipment can give *your* products the same uniform results. Call your Udylite representative today and let him show *you* Udylite short cuts to better plating. . . . or write The Udylite Corporation, Detroit 11, Michigan.

THE *Udylite* CORPORATION
DETROIT 11, MICHIGAN

PIONEER OF A BETTER WAY IN PLATING . . .

**EASY TO INSTALL AND INSPECT.** Interchangeable units; main bus completely accessible; incoming line connections are easily made.

**EASY TO WIRE.** Four-inch wiring trough; components accessible from all sides; front-connected starters; doors swing more than 90°.

**EASY TO SERVICE.** Units are easily disconnected from bus and locked in test position (above). Barriers between units are easily removed to facilitate wiring (below).

**FORD MOTOR COMPANY OFFICIALS INSPECT THE INTERCHANGEABLE UNITS OF THE . . .**

# New G-E Motor Control Center

Since January, over 10,000 men from production and management of leading industries (see above) have taken a thorough look at the latest equipment for the centralized control of a-c motors up to 200 hp. Their reports indicate enthusiastic approval of what they saw. Here's why:

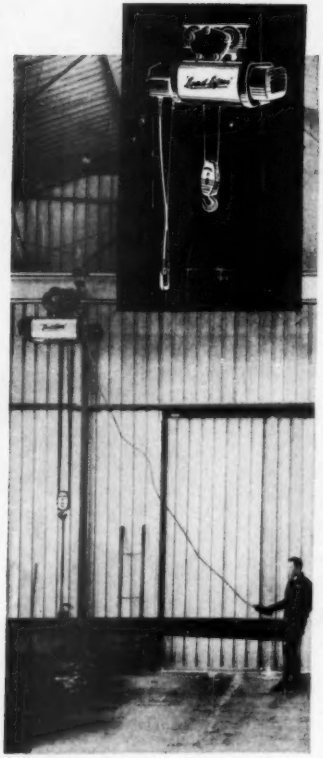
**VERSATILE.** Because units are easily interchangeable without waste space, a variety of arrangements can be made. For example—two Size 1 or 2 starter units require the same space as a Size 1, 2, or 3 reversing starter.

**ACCESSIBLE.** A four-inch continuous wiring trough provides ample wiring space. Components are mounted on an easy-to-handle frame and accessible from all sides when lifted from cabinet. Starters are front-connected. Master terminal boards can be swung out of compartment for extra working space around conduit.

**PROTECTED.** Will withstand 25,000 amperes RMS short-circuit current, substantiated by certified Laboratory tests.

For more information on this new G-E motor control center, contact your nearest G-E apparatus sales office or write for Bulletin GEA-4979A today. *General Electric Company, Schenectady 5, N. Y.* 730-42

GENERAL ELECTRIC



**SHORT CUT TO MORE PRODUCTION**

The "Series 700" 'Load Lifter' is the electric hoist for the job. It's fast — lifts a ton 30 feet a minute. It's easy to use. Push-button control eliminates muscle strain; the operator stays fit.

The 'Load Lifter' is tough, safe — has steel suspension; safety-type lower block and hook; motor and load brakes that require no attention; heat-treated helical gears; only 24 volts at the push button. Give *your* production a lift — at lower cost. Capacities: ½ ton and up. Write for 'Load Lifter' Bulletin 399.

'Load Lifter' ®
ELECTRIC HOISTS
MANNING, MAXWELL & MOORE, INC.
MUSKEGON, MICHIGAN

Builders of "Shaw-Box" Cranes, 'Budgit' and 'Load Lifter' Hoists and other lifting specialties. Makers of 'Ashcroft' Gauges, 'Hancock' Valves, 'Consolidated' Safety and Relief Valves, and 'American' Industrial Instruments.

# Test Your Reading Ability

**Answer the questions below *after* you have read "Positive, Synchronized Transmission Drive," on page 90. Then turn to page 284 for the correct answers.**

**1 · Transmission engineers have long looked for a single drive that combines two important features. Which two of the following are these important features:**
—a. Must be as positive in action as a gear drive.
—b. Must be as strong as a chain drive.
—c. Must be as flexible as a belt drive.
—d. Must be as economical as a fluid drive.

**2 · What kind of teeth does the time belt have:**
—a. Bronze.
—b. Cabled wire.
—c. Neoprene.
—d. Leather.

**3 · What's the widest belt size so far:**
—a. 5 in. —b. 10 in. —c. 15 in. —d. 20 in.

**4 · How fast will the belt go:**
—a. 4000 fpm.
—b. 8000 fpm.
—c. 12,000 fpm.
—d. 16,000 fpm.

**5 · The belt's stretch characteristics are such that:**
—a. You can make take-up adjustments fast.
—b. You can control creep to within 10% limits.
—c. You can use fixed-center drives.
—d. You can use your existing take-up adjusting devices.

**6 · One of the following is not a correct description of the belt. Which one is the incorrect statement:**
—a. There is no initial belt tension.
—b. The belt needs lubrication only once a year.
—c. The belt will give constant linear speed.
—d. There is negligible heat and horsepower loss by flexing.

**7 · As compared with V-belts or flat belts, this belt's sensitivity to misalignment is:**
—a. Greater —b. Less —c. About the same.

**8 · Why wasn't something like this belt successfully developed years ago?**
—a. In past designs, belt teeth jammed when rounding the pulley.
—b. In other designs, the wrong belting materials were used.
—c. Most earlier designs used the wrong type of gear pulley.
—d. Other designs used too many teeth per linear foot.

**9 · Which two of the following applications are ideal for the new belt?**
—a. Synchronized drives.
—b. Jobs requiring constant surface speed.
—c. Jobs requiring considerable belt slippage.
—d. Dichotomous drives.

**10 · How "tried and true" is this new kind of drive?**
—a. New and largely untried, but very promising.
—b. Tested out for about a year in key types of operation.
—c. Still in the laboratory stage, but ready to roll.
—d. Tested for years in actual service.

*Turn the page*

"You'll smile, too..."

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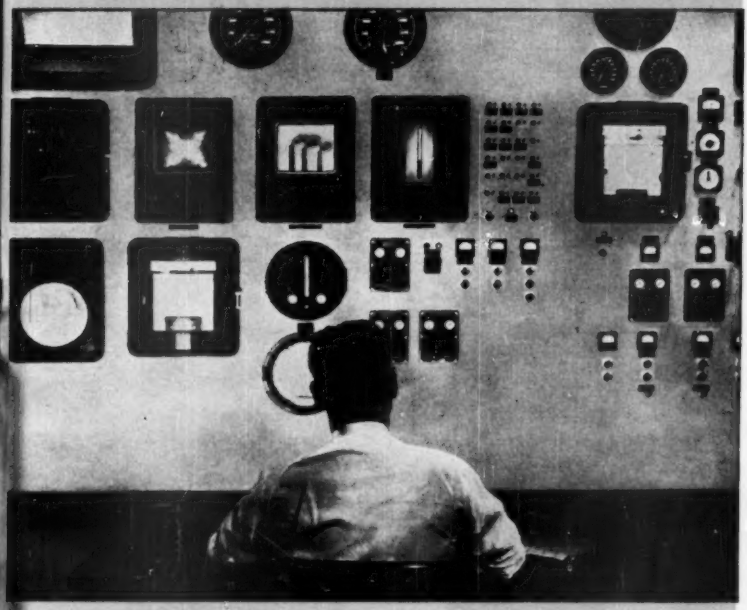
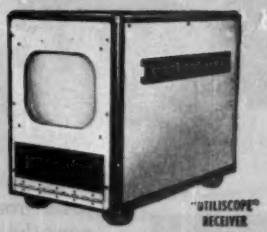
# DIAMOND "UTILISCOPE"
(WIRED TELEVISION)
## improves Centralized Control



Operator in central control room of large power station "SEES WHERE HE CAN'T LOOK". Here he watches flame conditions in boiler furnace, stack smoke discharge, and water level in boiler on "Utiliscope" screens of control panel.

Centralized control is much more effective if it brings a SENSE OF REALISM into the control room . . . if the operator can actually see what is going on outside his range of vision instead of depending upon indirect interpretations of operating conditions. The electric power industry has accepted the "Utiliscope" as an important factor in achieving better centralized control (as shown above).

The "Utiliscope" has many other uses in industry where its low cost is quickly amortized by improved operation, greater safety or savings in labor. It is surprisingly simple and requires no special skill for installation and operation. Stability and reliability are exceptional. For information on a wide variety of cost-cutting operations, ask for Bulletin 1025G



"UTILISCOPE" RECEIVER

"UTILISCOPE" CAMERA

OTHER USES—Watching flow of molten metal • Studying destructive tests of engines
Viewing nuclear research • Coordinating materials flow on conveyors.
The "Utiliscope" (Registered U.S. Patent Office)

4743

DIAMOND "UTILISCOPE" WIRED TELEVISION

WRITE FOR BULLETIN 1025G

**DIAMOND POWER SPECIALTY CORP.**
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Diamond Specialty Limited — Windsor, Ontario
Since 1903, Diamond has Manufactured
Quality Equipment For Industry


## TEST YOUR READING ABILITY

*Begins on page 282*

### SCORING INSTRUCTIONS

**Be sure to figure all three of your scores: comprehension, speed, and reading index.** For a full explanation of these scores, as well as information on how to improve your scores, see "How to Read Better and Faster," on page 84 of FACTORY's October 1951 issue. If you've passed your copy along to someone else, write the Editor for a reprint.

**Comprehension score:** Just add up the percentage credits for each of the questions you answered correctly.

**Speed score:** Refer to your note of how long it took you to read the article. Convert the time into seconds. Divide the result by 10. This answer you divide into 1159 (number of words in the article). Finally, multiply this last result by 6. This will give you your reading speed in words per minute. (If you recorded your time in decimal minutes, you can get the result directly by dividing the time into 1159.)

**Reading index:** To find your reading index, multiply your speed in words per minute by your percentage of comprehension and divide by 100. Do not figure reading index if your comprehension score is less than 75%. With lower comprehension, the reading index is not valid.

Now check yourself against this table of reading indexes: 400 or more (excellent; 300-399 (very good); 250-299 (good); 200-249 (fair); 150-199 (poor); below 150 (very poor).

Let us know how you came out on your reading score. A post card will do — sign it or not.

### ANSWERS TO TEST QUESTIONS

| Q | A | Credit | Q | A | Credit |
|---|---|---|---|---|---|
| 1 | a | 10 | 6 | b | 10 |
| | c | 10 | 7 | a | 10 |
| 2 | c | 10 | 8 | a | 10 |
| 3 | c | 5 | 9 | a | 5 |
| 4 | d | 5 | | b | 5 |
| 5 | c | 10 | 10 | d | 10 |

This INVINCIBLE Flux Recovery Unit..
Model 490, a compact unit designed for use with portable submerged arc welding equipment.
SALVAGES VALUABLE WELDING FLUX
SAVES COSTLY MAN-HOURS
SPEEDS AND IMPROVES WELDING

Our Invincible gives "very good results" is the report from The Rud Machine Co. of Cleveland. They use it extensively when repairing ships that carry freight over the Great Lakes. During winter months when the freighters are in port, Rud operates the unit almost every day.

On all sorts of submerged arc welding, hundreds of Invincible Flux Recovery Units are paying for themselves by:

**1. SAVING VALUABLE FLUX—**
Invincibles recover all loose flux from the work, remove slag or fused particles, and return the unfused flux to the hopper of the welder. These operations are performed in a continuous flow.

**2. SAVING COSTLY MAN-HOURS—**
Invincibles do the job *automatically*—far more rapidly and efficiently than manual methods.

**3. SAVING EXPENSE OF REJECTS—**
By removing all fine dust (flux flour), Invincibles reduce welding rejects and speed production.

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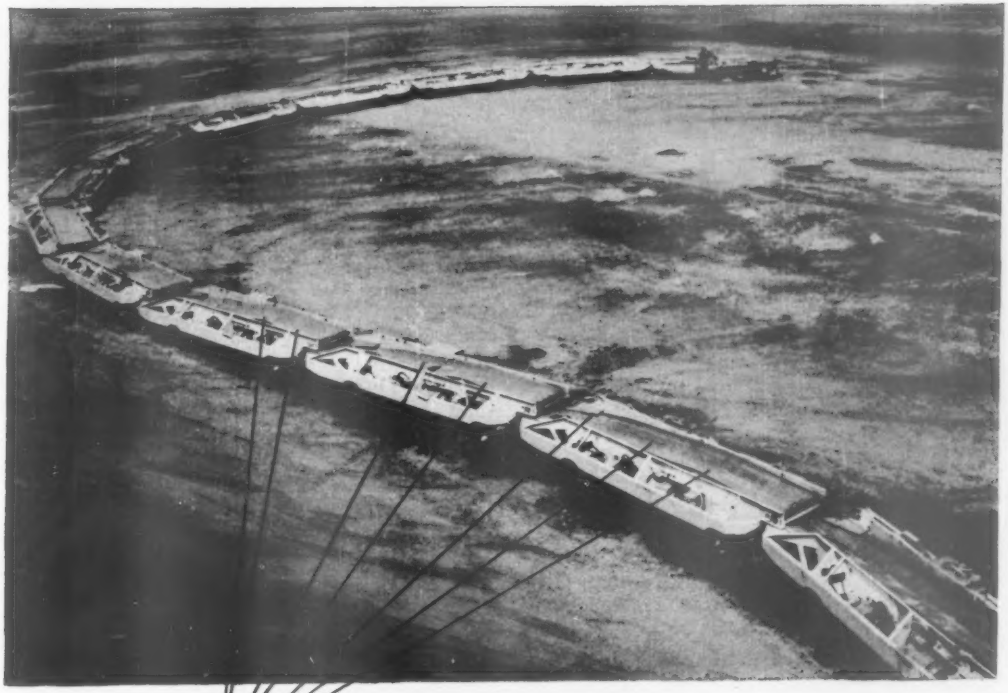

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A conveyor belt that can twist around corners to reach the spot where coal is being mined—the "Molveyor," shown above—is a new development in continuous mining. It's a series of short conveyor belts on wheels, individually powered, linked together to carry coal back to the main conveyor in a steady flow.

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The solution was reinforcement with Du Pont Cordura* High Tenacity Rayon. Here, as in a widening variety of products, "Cordura" gives *greater strength with less bulk* . . . virtually eliminates stretch.

If you would like to find out more about "Cordura" yarn, send for the free booklet "Sinews for Industry." It tells how "Cordura" improves the products you use, and may also suggest improvements in the products you make.

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# What's Ahead for High-Level Skill Training?

By WILLIAM H. MINOR • Training Officer
Warner Robins Air Material Area, Macon, Ga.

**Here are some answers to this important question that should make you sit up and take notice as far as your own plant is concerned. Looks like the big impact of the "factory of the future"—which is coming fast—is going to make a lot of us revise some of our thinking about skill-training. Here's why—and how.**

THERE ARE NOW about 300 occupations for which apprentice training is being offered. These affect perhaps more than 200,000 employers. In three centuries of apprentice training many changes have taken place, with the present trainee bearing little resemblance to those bound to their masters as late as the middle 1800's.

Most of the changes have affected the relationship of the trainee to the master. But some have been revolutionary variations in methods of instruction.

More changes are yet to come as a result of demands made by both labor and management. Not a few of these will follow a sudden realization that some trades are not, in the past meaning of the word, apprenticeable at all.

Such a statement may seem to toss a bombshell into our ideas of apprentice training. But it should not.

The inherent inertia of a program often prevents its step-by-step evolution. In the case of a training method as well-established as apprenticeship, any change is revolutionary when it does come.

## EFFECTS OF IMPROVED TECHNOLOGY

Developments in equipment have been great during the past decade. The most disconcerting to the technician are those specialized components that actually take the place of skilled individuals. The technician is usually completely unfamiliar with these components.

This might sound something like doubletalk, but it is quite simple. In the past we have accepted—almost without question—the idea that a human is the final link in a series of operations. Action is taken based upon reasoning performed by the individual. But many machines are now being produced which act as their own "judges," depending upon simple reasoning, of which they are capable. A worker's skills are thereby eliminated. But the necessity for the *knowledge* which he originally possessed is *not* eliminated. *This knowledge requirement is simply passed on to the men responsible for operation and maintenance of the machinery.*

*Turn the page*

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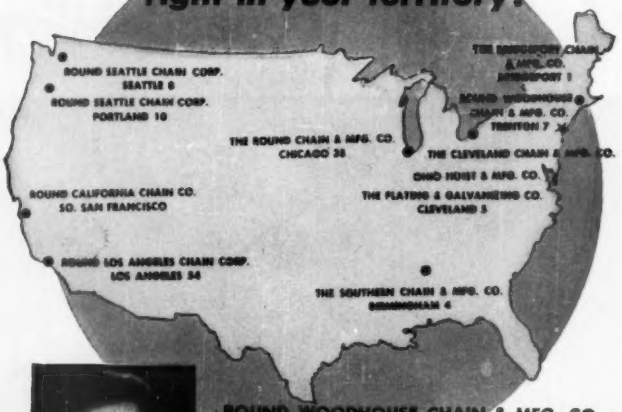

W. J. KEENAN

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THE OLDEST NAME IN ROUND CHAIN


## WHAT'S AHEAD FOR SKILL TRAINING?

*Begins on page 288*

All of this means that the apprentice learning a trade is likely to find that the mental demands may far outstrip the manipulative skills that once went with the trade. Obviously this is a decided change in the concept of apprentice training.

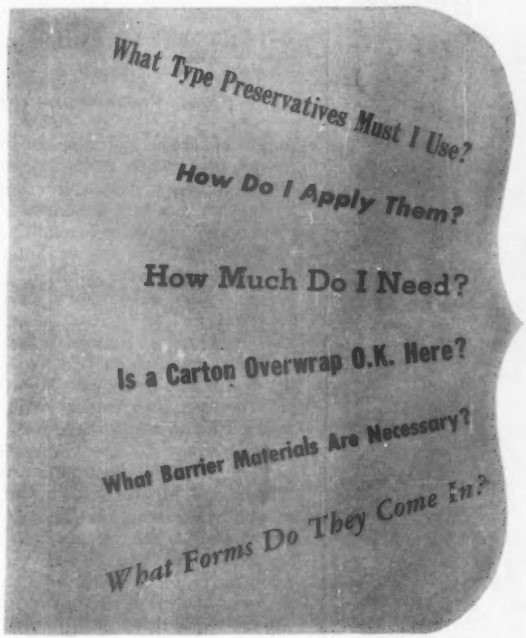
### THE TRAINING PROBLEM

Under our present state of technical advancement, a trade can change in character overnight so that the fully trained journeyman finds himself with little or no knowledge of the new skills that are needed. The skilled worker may not even be aware of the new problems until he meets them in the form of new equipment. You need only look at the sudden introduction of the radio mechanic to television to prove the point.

The attendant headaches of sudden change lower the efficiency of a work force. This alone is good reason why management, through its training organizations, should be sensitive to changes in concept at research levels that will affect production requirements.

The need for instruction in associated information is now being met by classroom teaching. This method has created problems for industry as well as the apprentice. Arrangement of classroom curricula can very well lead to dictation, where training demands that production follow a prearranged schedule. Production officials should not be expected to arrange their productive efforts to the convenience of training. The obvious solution for the future is to set up an off-the-job curriculum completely independent of the sequence of on-the-job work.

Much classroom work is now given by men who are already journeymen in the trade. They may not be familiar with good teaching method, and may know no more about the associated in-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Now, you can drill any type of masonry easier . . . brick, concrete, marble, slate, tile, and plaster. Arro's new improved Arroflute Masonry Drill with carboloy cemented carbide tips—drills faster, easier, cleaner and deeper than any other drill.

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## WHAT'S AHEAD FOR SKILL TRAINING?

*Begins on page 288*

formation than the apprentices whom they teach. This is, of course, a perpetuation of internal inadequacy not to the benefit of either labor or management.

The results may be no better where classroom instruction is given by men chosen specifically for their ability to teach. They may come with inadequate experience in the trade. They may not understand the exact relationship between the classroom information and skills of the trade.

Unfortunately, too, courses patterned after curricula in schools fail to satisfy the needs of apprentice training. They do not contain a direct association with trade skills, but rely heavily upon the transfer of information. A more critical error is that of attempting to teach the associated information as a skill within itself.

Teaching associated information as a *skill* is not only useless but, in most instances, impossible. Our complex engineering has produced equipment that involves so many complex subjects that few men would be capable of absorbing knowledge of all of them in a single life time.

Take the case of the mechanic who is to work on some of the modern developments for war. He would be required to fully understand navigation, electronics, servo-mechanisms, mechanics and physics—and, in addition, to be thoroughly skilled in the use of hand tools and specialized test equipment.

Of course this situation has been recognized. Instead of designing a curriculum to provide for fully qualified technicians, companies have diluted jobs and created a great number of specialists. If this is carried to an extreme, industry will find itself with a vast amount of equipment and not enough specialists to go around. To a certain extent this has happened already.

*Turn the page*

nstallation view (right) shows the Jeffrey Hinged-type Apron Conveyor operating beneath a punch press in a machine shop.

IN PLANNING FOR "WHAT'S AHEAD" . . .

# CONSIDER THESE PRODUCTION AIDS

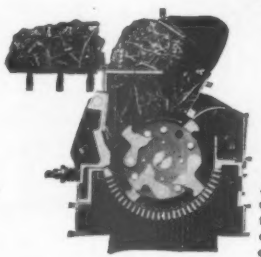
CONVEYORS • AERATORS • SKIP HOISTS • WEIGH LARRIES • CRUSHERS • PULVERIZERS • MOLD CONVEYORS • FLASK FILLERS • MAGNETIC SEPARATORS • CAR PULLERS • FEEDERS • TRANSMISSION MACHINERY

Hinged-type Steel Apron Conveyors — especially suitable for handling small, light-gauge metal parts. With lifting blades will convey up steep inclines, making a compact unit for carrying small parts from quenching tanks, heat-treating operations or from beneath punch presses, upsetters and other automatic machine tools. See two photos top right.

Metal Turnings Crushers — for uniform reduction of long coils of alloy or high carbon steel and brass turnings into short or shoveling lengths — can be arranged for side or top feed by hand or conveyor. Note cross-section.

Also shown at extreme right are a continuous Bucket Elevator and two sections of Jeffrey Chain. All of these units designed to speed production and reduce costs. May we make other suggestions to help you in your planning for "What's Ahead"?

Coiled section (below) of the hinged-type Apron Conveyor. Rolled hinges insure full flexing and prevent material wedging between flights when curving. A tight, continuous moving trough — can be perforated for salvaging coolant.





Jeffrey Metal-turnings Crusher for uniform reduction of steel or brass turnings. Specially shaped crushing elements. If desired, a specially-designed feeder-conveyor can be supplied.

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*Scientific cleaning materials since 1896*

## WHAT'S AHEAD FOR SKILL TRAINING?

*Begins on page 288*

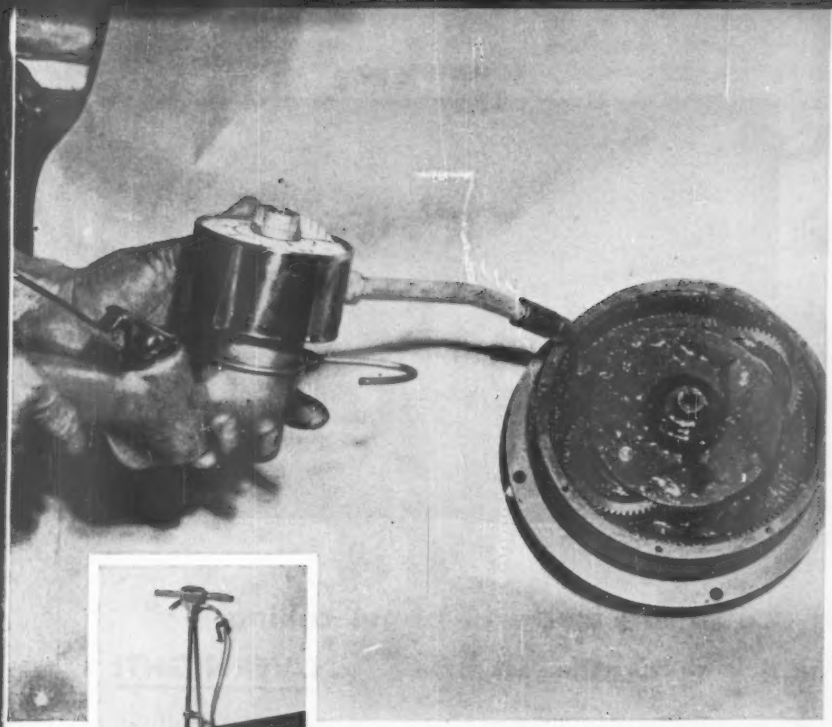
### THE IMPACT OF "TECHNICAL INFLATION"

The current demand for skilled mechanics has placed a severe—if not impossible—strain upon the available pool of manpower. As a result, hiring standards have been lowered to the point where a minimum of experience qualifies a man for the position once held by a fully qualified journeyman. This is "technical inflation," pure and simple. The fact remains that as the requirements fall below the time for completion of apprenticeship, the trainees will neither enter nor complete an apprentice program. They will simply hire in at the journeyman level and standing. Once conditions become more "normal," the weaker individuals will be dropped.

No indenture can or should be written to tie an individual against his will. It remains for the training director to make every effort to hold apprentices for their full term. Actually this is as much a protection of the individual as a benefit to industry—although it may be a trifle difficult to convince the prospective apprentice of it, in the face of journeyman wages.

In conclusion it might be said that industrial executives, especially training executives, are faced with some difficult problems. Developing off-the-job instruction that differs radically from previously acceptable academic procedure means tampering with fundamental precepts of education. New training concepts will have to be developed.

Training and personnel people in particular will also face the tremendous task of acquainting themselves with changes and development in research laboratories. Only by anticipating their effects upon engineering can they re-define necessary training goals.



# Solves leakage problem . . .

● Multi-clean Products, Inc., St. Paul, Minnesota, manufactures industrial floor polishing and scrubbing machines. The machines are shipped with grease already installed in gear reduction units. The problem faced by this company was one of finding a grease that would stand up under hard service and not leak from the gear units. Greases tried either caused or threatened leakage troubles.

Called in on this problem, a Standard Oil lubrication specialist recommended STANOBAR Grease "S", a highly stable grease with a unique adhesive characteristic. Given an accelerated service test, STANOBAR did not leak from the gear unit, and its consistency showed no change that would later cause a leakage problem. There was no wear of gears or bearings. Adopted for use in the units, STANOBAR has solved this company's lubrication problem on every count. Officials have been able to eliminate the costly and troublesome practice of having all units returned to the factory, at 12 months intervals, to be repacked with grease.

**STANOBAR**
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**Grease**

The same lubricating qualities of STANOBAR that solved this problem for Multi-clean Products, Inc. can serve you in a wide variety of applications. A Standard Oil lubrication specialist will be glad to discuss those applications with you. He's right there in your section of the Midwest. You need only phone your local Standard Oil office. Or write, Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

# What's YOUR problem?

**C. L. Daub** of Standard Oil's Minneapolis office is the lubrication specialist who helped Multi-clean Products, Inc. solve an important lubrication problem through his recommendation of STANOBAR Grease.

Like all Standard Oil lubrication specialists, he has a broad background of practical experience plus thorough training in Standard's own schools. And like all lubrication specialists, his on-the-job assistance is always available to the industries in the immediate area he serves. He is one of a corps of experienced men who make their headquarters wherever industry is located throughout the Midwest. Call for the services of your Standard Oil lubrication specialist today. When he stops at your plant, be sure to get information on these outstanding products:

**STANOIL Industrial Oils**—This multi-purpose line of oils provides cleaner operation of hydraulic units, supplies effective lubrication in compressors, gear cases, and circulating systems. One of two grades can replace a wide variety of special oils and lubricants.

**CALUMET Viscous Lubricants**—On open gears and wire rope, these greases resist washing and throw-off. Their superior wetting ability affords better coating of gears and better internal lubrication of wire rope.

**STANORUST Rust Preventives**—The eight grades of STANORUST form one of the most complete and effective lines of rust preventives on the market today. Each has been scientifically and specially developed for its intended use. The grades range from a fingerprint remover to a heavy semi-solid that protects against corrosion for years under the most severe outdoor exposure.

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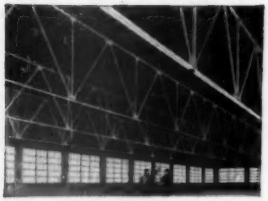
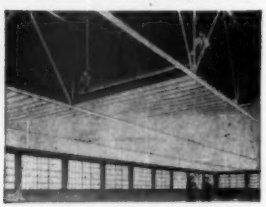


To this old factory . . .



they simply did this . . .

to get this . . .

# Fenestra acoustical-structural panel ceiling changes old factory into modern office . . . OVERNIGHT!

Out of a sow's ear . . . !

A big Michigan concern needed office space in a hurry and the only available building was an old one-story factory.

Steel beams (the bottom chords of the roof trusses) ran clear across the building . . . every 20 feet.

So they simply laid 20-foot Fenestra* Acoustical-Structural Steel Panels side by side, from one beam to the next. Quickly, inexpensively, the long, strong panels interlocked into a flat, handsome acoustical ceiling . . . and acted as a load-carrying storage floor for ducts, air conditioning, electrical services and such.

While they were doing all this, the company employees went right on working below. Using the first few panels laid as a storage and working platform the installation crew stayed up above. And, of course, there was neither dirt nor dust to shower down below.

They can clean their Fenestra acoustical ceiling with soap and water, or paint it without hurting its acoustical efficiency. And, of course this acoustical ceiling is noncombustible.

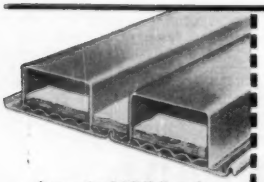
## Cost?

***Less than $1.25 per square foot . . . installed!***

If you would like to know more, write to the Detroit Steel Products Company, Department FM-12, 2266 East Grand Boulevard, Detroit 11, Michigan. Also ask about the other money-savers you see illustrated below. *®

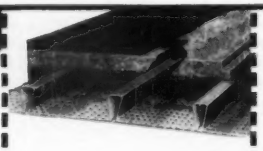
## *Fenestra* METAL BUILDING PANELS

**. . . engineered to cut the waste out of building**



**Acoustical "D" Panels for roofs, floors, ceilings. Width 16″. Depth 1½″ to 7½″.**

**"C" Insulated Wall Panels. Width 16″. Depth is 3″. Steel or aluminum.**

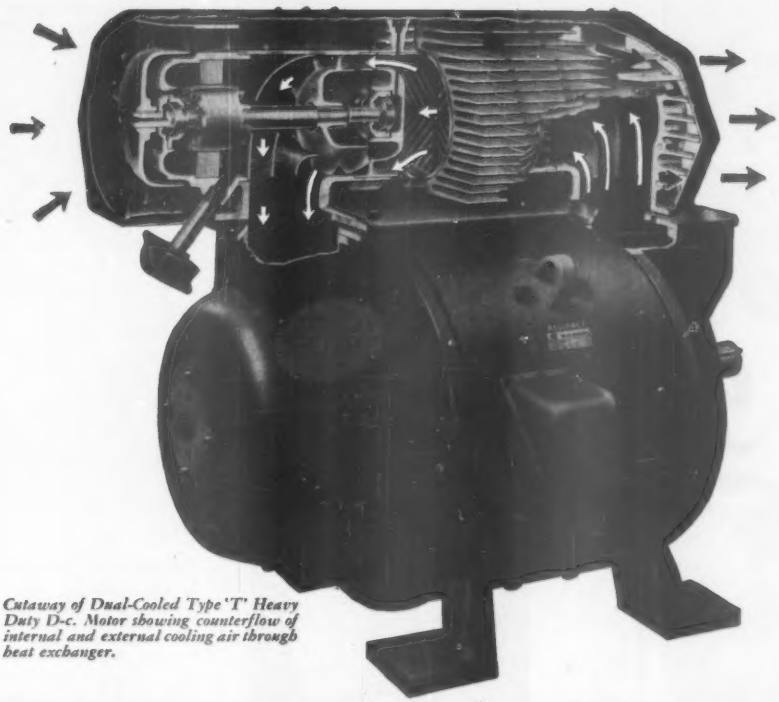


**Acoustical Holorib for acoustical-structural roof. Width 18″. Depth 1½″.**

**Acoustical "AD" Panels for ceiling-silencer-roof. Width 16″. Depth up to 7½″.**

# RELIANCE *Totally-Enclosed* *Dual-Cooled* D-C. MOTORS

PATENT APPLIED FOR



*Cutaway of Dual-Cooled Type 'T' Heavy Duty D-c. Motor showing counterflow of internal and external cooling air through heat exchanger.*

## for Wider Speed Ranges... Higher Ratings

New Reliance Dual-Cooled Motors provide dependable totally-enclosed, fan-cooled operation over wider speed ranges and higher ratings than were ever before possible . . . and this is accomplished with floor-space savings of up to 30%!

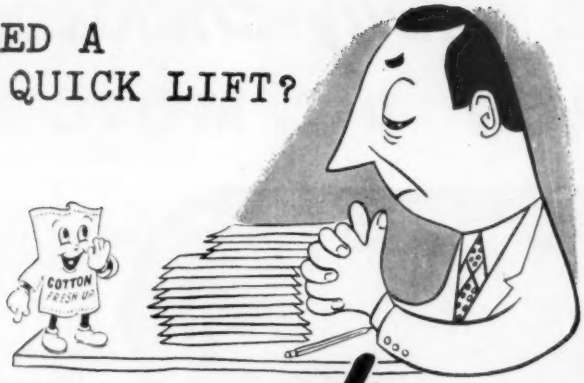
Dual-Cooled Motors are completely enclosed... have two separate cooling systems operating independently of the motor speed. One system circulates high-velocity air within the motor, that is cooled in the finned inner duct of the heat exchanger. This heat is dissipated in the other system by air sweeping through the fins of the outer duct.

The Dual-Cooled Motor is especially adaptable to Reliance adjustable-voltage V•S Drive and is available in ratings from 15 through 150 horsepower. Explosion-proof Dual-Cooled Motors are available through 100 hp., in conformity with Underwriters and Bureau of Mines specifications.

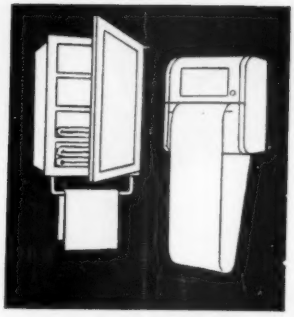
Whatever your application . . . get further details from the nearest Reliance Sales Office . . . or write for Bulletin C-2201.

**RELIANCE ELECTRIC AND ENGINEERING CO.**

NEED A
QUICK LIFT?




Go wash your face!



When you find yourself slowing down and the work piling up, you need a quick pick-up — GO WASH YOUR FACE. It's amazing how fast you wake up after soap and water and a brisk rub with a clean cotton towel. Rub as long and as hard as you please—a soft, absorbent cotton towel always gives you a lift, leaves you feeling fresh and clean.

COTTON TOWEL SERVICE

**No investment required. Get complete service on a low-cost basis. Under "Towel Supply Service" or "Linen Supply Service" in the telephone book, you'll find your suppliers—call them today!**

*WHAT PICKS YOU UP, PICKS UP YOUR EMPLOYEES. When you provide clean cotton towels, workers get added benefits from their rest periods. Watch efficiency, production, and morale climb when "Cotton Fresh-Up" is on the job.*

Linen Supply Association of America
*and* NATIONAL COTTON COUNCIL
22 W. MONROE ST., CHICAGO, ILL.

# NEW MATERIALS

**SYNTHETIC ENAMEL** that solves the problem of coating and decorating chemically inert polyethylene has been developed by Schwartz Chemical Co., 326 W. 70th St., New York 23. Called Polynamel, the new lacquer is said to have excellent adhesion qualities. It can be sprayed or brushed on and is baked or force-dried at 150F. for one hour.

**COPPER-BASE ALLOY** containing controlled amounts of tellurium, nickel, and phosphorus is offered by Chase Brass & Copper Co., Waterbury 20, Conn. Named Telnic bronze, new alloy features excellent machinability, good electrical conductivity, high fatigue strength, and good corrosion resistance. Properties are said to be superior to other high-copper machinable alloys, including leaded copper and leaded commercial bronze.

**TEFLON EXTRUDED TUBING** is now available in many sizes from Ethylene Chemical Corp., 245 Broad St., Summit, N. J. Maker claims extremely good concentricity and almost perfect roundness and straightness. And control of inside and outside diameters is held to tolerances as close as 0.005 inch. Range of sizes: 3/16- to 2-in. O.D.; 1/16- to 1⅞-in. I.D.; wall thicknesses as low as 1/16 inch.

**FLUID SOUND DEADENERS** can be applied with wipe-on tool or spray gun. Carey Sound Deadeners No. 40 and No. 41, made by Philip Carey Mfg. Co., Cincinnati 15, bond permanently to metal. They can be painted with emulsion-type paint when dry, and any quick-setting lacquer on thermo-setting enamel can be sprayed over the emulsion before they have dried. Can be baked at temperatures up to 325F.

*Turn the page*

# ARO

Small size, light weight makes ARO Tools handy for close-quarters assembly.

SCREWDRIVING . . . another assembly job done faster with Aro Tools!

NUTSETTING is simple, speedy, with Aro Tools and Balancers.

Easy to operate small, light weight ARO Tools in screwdriving or nutsetting.

Here are some of the many ways that ARO Air Tools keep production rolling for Lionel Corporation . . . assembling a great variety of toys in their plant at Irvington, N. J.

Let an ARO Field Engineer help you solve production problems in screwdriving, nutsetting, grinding, sanding, drilling, mixing, etc. Write ARO or see your ARO distributor.

**The Aro Equipment Corp., Bryan, Ohio**
Aro Equipment of Canada, Ltd., Toronto, Ont.

DRILLING with Aro Tool saves time in assembling toy locomotives.

**ARO**

*The Leader!*
**AIR TOOLS**
Also . . . LUBRICATING EQUIPMENT . . . HYDRAULIC EQUIPMENT . . . AIRCRAFT PRODUCTS . . . GREASE FITTINGS

MHS

TOW-LINE CONVEYOR

Simplifies
Coordinates
Regulates
Expedites

It's so easy for a rush of work to throw a shop, an order department, shipping facilities or warehouse into confusion. Then production suffers, deliveries are late and costs zoom.

One dependable remedy is the time-tested MHS Tow-Line Conveyor that keeps operations moving along at a steady, orderly pace—keeps human mistakes at a minimum.

The tow-chain can be entirely below floor level—no obstructions on the floor whatever. Or the chain can be overhead if that's desirable. In either case, dolly trucks can be hooked on or released anywhere, at any time.

No limitations on the length of the system or on the number of turns. Same system may be all on one floor or it may serve two floors—entirely flexible.

Send for Bulletin TC-1 and look over the specific details as applied to your operation.

Mechanical Handling Systems, Inc.

4608 NANCY AVE. • DETROIT 12, MICH.

Offices in Principal Cities

In Canada: Canadian Mechanical Handling Systems, Ltd.

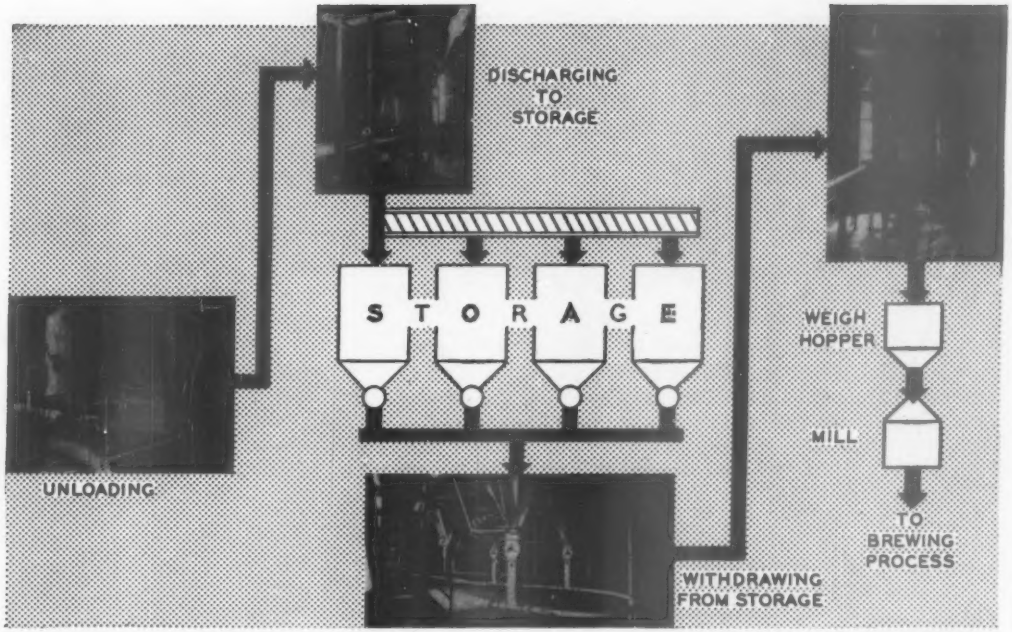

# NEW MATERIALS

*Begins on page 298*

**NEW PAPER MATERIALS** containing cork and treated with rubber or resin have been developed by Armstrong Cork Co., Lancaster, Pa. You can use them as improved replacements for present felt or board applications. The first, called CS-402-A, can be embossed under heat and pressure. CS-403 makes a good backing for leather. CS-404 gives you a good cushion backing for coated products. CS-405 is a paper with better than average strength and water resistance. And you can shape and form CS-406 under heat and pressure.

**ACID-RESISTANT PORCELAIN ENAMEL COATING FOR STEEL,** described as the most effective yet developed, is announced by Seaporcel Metals, Inc., 28-20 Borden Ave., Long Island City 1, N.Y. Labelled CRC-14, the new coating is said to withstand a boiling 1% sulphuric acid solution with weight loss of 1 mg. per sq. in. during a 24-hour period. Thermal shock tests have shown CRC-14 can withstand five cycles at 800F. Makers add that characteristics of finish on low-carbon steel compare favorably with those of stainless steel.

**WAX-CUT,** a compound that improves metal-cutting action and reduces tool wear, now is available in concentrated form so you can prepare your own cutting solutions and reduce costs accordingly. Made by S. C. Johnson & Son, Racine, Wis., Wax-Cut concentrate is a blend of special waxes that can be mixed 10 to 1 with any type of oil, including reclaimed motor oil and paraffin and sulphurized oils. Lowers cost of wax-base cutting fluids that reduce tool wear. Can be used on automatic screw machines, gear hobbers and cutters, milling machines, and oil-type grinders.




Materials flow diagram shows reason for "No Hands" operation at Centlivre. From transport to process, grains are handled automatically by Dracco Airstream Conveyor.

## Airstream ESTABLISHED "NO HANDS" PROCESSING AT CENTLIVRE

An automatic Dracco Airstream Conveyor system has eliminated all manual handling of grain, grits and malt at the Centlivre Brewing Corporation in Fort Wayne (Indiana) where "Old Crown" beer is "lazy-aged" to tasty perfection.

From incoming transport to cooker, the grains in this modern brewery are moved by Airstream in a swift, sanitary operation. They are (1) unloaded to bin storage, (2) conveyed from storage to automatic weighing in scale hoppers, and (3) transported to the brewing process. These are accomplished accurately and efficiently with a great reduction in the cost of physical labor and its unavoidable errors.

If you have a handling problem involving dry granular or powdered materials, Dracco techniques and Dracco equipment can provide a cost-saving solution. Why not call in a Dracco engineer today? There is no obligation.

**DRACCO CORPORATION**
**Harvard Ave. and E. 116th St., Cleveland 5, Ohio**

*For further information on handling bulk materials with Dracco Airstream Conveyors write Dept. F-12, Cleveland 5, Ohio. Ask for Bulletin 529.*

**DRACCO** *Performance Proved*
**Airstream CONVEYORS · DUST CONTROL EQUIPMENT**

**"Bill, making or losing money today**

**can depend on**

# The Turn of a Screw!"

*"Stop pulling my leg,"* Bill retorted skeptically.

*"I'm not exaggerating. You can't afford to take your fasteners for granted,"* Bob insisted. *"I'm saving time—and time is money—just by following the RB&W man's suggestion to use another kind of screw in my TV sets."*

*"What kind?"* asked Bill.

*"RB&W's new SPIN-LOCK Screw,"* answered Bob. *"It has a patented feature—ratchet-like teeth under the head—that not only locks into the surface and holds tighter, but also speeds assembly. It does away with extra parts and special handling. Bet your switches could use 'em, Bill."*

MORAL: Look to your fasteners for an often overlooked opportunity to reduce costs, and strengthen your competitive position. New fasteners may prove more efficient than the ones you're now using. Or you may save by the stepped-up production you get from using the finest fasteners . . . RB&W bolts, nuts, rivets and screws of uniform accuracy, dependability and physical properties.

Let RB&W help you make the most efficient use of fasteners on your assembly line. Address RB&W at Port Chester.

RB&W—The Complete Quality Line. Plants at: Port Chester, N.Y., Coraopolis, Pa., Rock Falls, Ill., Los Angeles, Calif. Additional sales offices at: Philadelphia, Pittsburgh, Detroit, Chicago, Dallas, San Francisco. Sales agents at: Portland, Seattle. Distributors from coast to coast.

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## *Simple as Filing your Correspondence!*

Compartments easily installed and replaced.

...lem of where to pla... ...ontrols is greatly simplified by ... ...letin 6200 CONTROL CENTERS.

These neat, trim, dead-front cabinets can be set up in any straight line or right angle pattern—as convenient and accessible as the file cabinets in your office . . . When you need additional control, you can line up new sections just like adding more file cabinets . . . When machinery or equipment must be moved, the flexibility of placement and arrangement of CLARK CONTROL CENTERS makes it easy to move them along and ... requirements . . . W... tenance or changes are ne... can take out any plug-in compartment by merely removing two screws. Compartments are interchangeable . . . Where space is limited, you can use the "back-to-back" type—accommodating twice as many compartments within the same dimensions as the front-line type.

### CLARK CONTROL CENTERS give you:

1. Pan type hinged doors.
2. Provision for locking.
3. Liberal wiring space.
4. Accessibility of control equipment from the front.
5. Easily removable "plug-in" compartments.
6. Accommodations for combinations of starters, sizes 1 through 5.
7. Vertical wiring gutter 6" wide, with front-opening hinged doors.

*Consult our nearest office for further details.*

THE CLARK CONTROLLER CO.

ENGINEERED ELECTRICAL CONTROL • 1142 EAST 152ND STREET, CLEVELAND 10, OHIO

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*VEL-LURE*

Versatile Vel-Lure slashes painting costs and eliminates inconveniences—spreads fast—dries velvet smooth—leaves no brush or lap marks—and the room is dry in less than 30 minutes—no long departmental shutdowns—looks brand new—smells fresh and clean.

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# BOOKS

## For all Plant Executives

### FACTORY FOLKWAYS

By JOHN S. ELLSWORTH, Jr. Yale University Press, New Haven, Conn. Charts, references, bibliography, index. 284 pp. $4.

One thing we are likely to forget in our rush-a-day work-week—the factory has become a second home, one with a full cupboard of human relationships. The author's theme is that we must take this second home into account if our industrial civilization is to operate efficiently.

If you want to dig deeper into the problem of human behavior in your plant, this book should give you a strong push in the right direction.

The author shows you how the principles of social science can provide useful analytical tools and profitable guides for industry. He does this by telling you the story of the employees and management of the New Freedom Products Company, a small New England plant in Teasville, population 4000. The names are mythical, but the plant and town are real. And the book is not the result of meditations in an ivory tower. The author gathered most of his material during eight years as an employee in every department of the plant.

You follow the New Freedom Products Company from its Yankee-English beginnings, in 1836, through the stresses of the Civil War, the first World War, the Depression, and the second World War. You experience the impact of incorporation, the incentive system, the Wagner Act, the union. All the factors driving a wedge between the people in the front office and the plant

# HALLOWELL'S NEW "640" SERIES

## *UNIT* work benches

Multiple Unit design—only five component parts—enables you to *custom build* HALLOWELL Unit Work Benches to fit your requirements. Ample storage space encourages good housekeeping. Standardized construction permits individual or continuous bench installations . . . provides interchangeability with existing HALLOWELL Work Benches of similar dimensions. Write for literature today. STANDARD PRESSED STEEL CO., Jenkintown 11, Pennsylvania.

3 BASIC MODELS
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5 BASIC PARTS
for your convenience

| MODEL | COMPONENT PARTS |
|---|---|
| 640 | 1 bench top<br>1 drawer unit<br>1 cabinet unit<br>2 bases |
| 643 | 1 bench top<br>2 drawer units<br>2 bases |
| 646 | 1 bench top<br>2 cabinet units<br>2 bases |

HALLOWELL® SHOP EQUIPMENT DIVISION

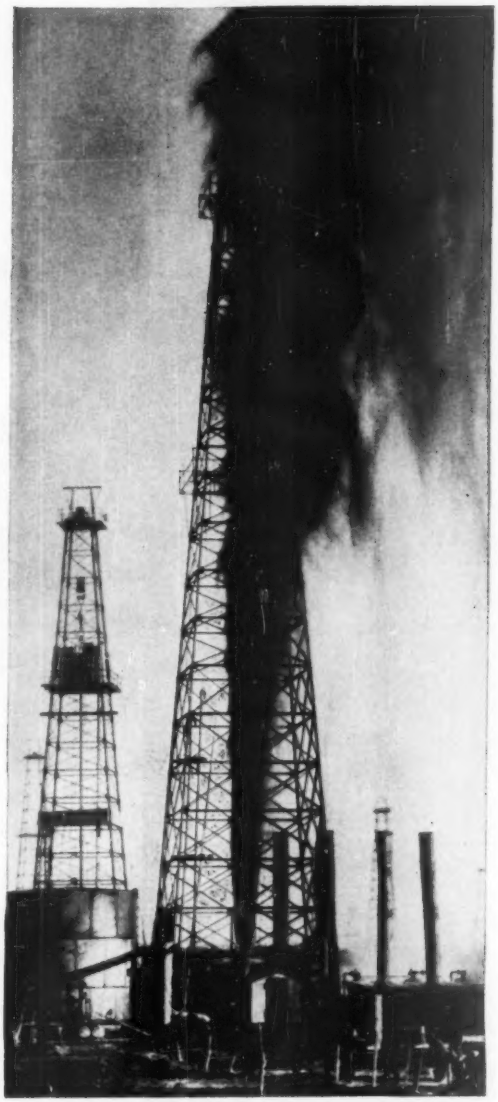
SPS

JENKINTOWN PENNSYLVANIA

You can't stop a gusher with a bottle cap

You can't stop corrosion with ordinary paints . . .

# it takes BITUMASTIC COATINGS!



**CORROSION** can't be stopped by ordinary paints or conventional protective coatings. They can't protect surfaces against the ravages of rust for any appreciable length of time.

But Bitumastic Coatings can!

Unlike maintenance paints, Bitumastic® Protective Coatings are specially formulated from a base* of coal-tar pitch that is, for all practical purposes, impervious to water. When you keep moisture away from an exposed surface, you *stop* corrosion.

Bitumastic Coatings provide an extra-tough, extra-thick barrier against corrosive elements—a barrier that is impenetrable. And these coatings provide up to 8 times the film thickness of conventional paint coatings.

Bitumastic Coatings stop corrosion caused by moisture—acid fumes—alkaline fumes—corrosive soil—salt air—heat.

*Hi-Heat Gray contains a metallic base.

*There are 6 Koppers Coatings—formulated to control corrosion of metal and deterioration of concrete. Use the coupon for full information.*

SEND FOR SET OF FREE BOOKLETS!

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# BOOKS

*Begins on page 304*

are put under a magnifying glass for your scrutiny.

The book is highly readable until it gets into technical sociology in the latter chapters. How far you read from there depends on how much interest the first half of the book stirs up. But, on the whole, the writer serves up the problem of employee-management relationships in a palatable manner. And he does a goob job of explaining the thoughts of the worker who says, "I have two homes, my home where I live and my factory home where I work."

## Book Briefs

**TECHNICAL REPORTING**

How to put your ideas on paper clearly and efficiently—from the research report to the mere inter-office memo. Every phase of technical writing discussed and illustrated. By Joseph N. Ulman, Jr. Henry Holt & Co., Inc., 383 Madison Ave., New York 17. 289 pp. $4.75.

**FLUORESCENT LIGHTING**

The scientific and technical fundamentals, and the applications of the fluorescent lamp and its accessories. Illustrations, diagrams, and photographs. Edited by C. Zwikker. Elsevier Press, Inc., 300 Park Ave., New York. 248 pp. $6.25.

**NOMOGRAPHY AND EMPIRICAL EQUATIONS**

Shows you two useful techniques for handling experimental and operational data: (1) nomographs, which provide quick, graphical answers where numerical data are substituted in formulas; and (2) empirical equations — mathematical expressions of data plotted in the

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AROUND YOUR PLANT
Allis-Chalmers
HD-5G
1 and 2 cu. yd. buckets. 40 drawbar hp. Dumping Height — 9 ft. 1⅛ in. — other models with buckets to 7 cu. yd. and up to 175 net engine hp.
HANDLES MATERIALS — indoors or out.
Scoops up and carries a full cubic yard at a pass — two yards with bucket for light materials such as coal. Only a crawler tractor gives you the traction, power and flotation for working under any conditions. And this A-C crawler gives you an extra, fast reverse to increase output, plus 1,000-hour lubrication of truck wheels to save you 30 minutes' greasing time every day.
STORES COAL, compacts and reclaims it.
This flexible unit builds stockpiles in any available space. Spreads and packs coal in thin, horizontal layers to eliminate spontaneous combustion. As coal is needed, the HD-5G loads from stockpile to trucks. On short hauls, it dozes or carries coal direct to plant.
CLEANS UP WASTE — loads or carries it.
Out in the yard, this busy tractor cleans up and loads industrial waste, excavates, trenches and backfills on new construction, spots cars, clears snow . . . handles many other jobs winter and summer.
Interchangeable attachments for the HD-5G include: Special buckets — up to 2 yd. . . Lift Fork (below) for handling palletized loads . . . Crane Hooks for heavy lifting . . . Bulldozers for any excavating . . . Trench Hoe for footings, pipe, other trenching

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TRACTOR DIVISION · MILWAUKEE 1, U. S. A.

Find out how Allis-Chalmers Tractor and Tracto-Shovels can improve material handling around *your* plant — send coupon for information or demonstration.

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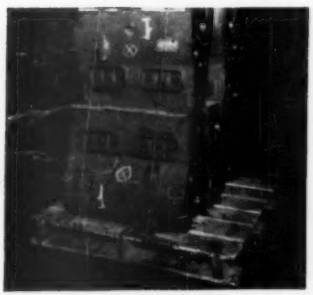
# You can cut the cost of every tie with GERRARD STEEL STRAPPING

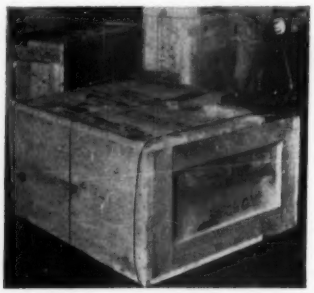
● Gerrard Round Steel Strapping costs about 40% less than any other metal reinforcement. In addition to this initial saving, the fast, efficient, dependable operation of Gerrard machines can help you cut tying time and speed production.

You need not worry about the strength of the Gerrard tie. It has been job-proved on parcel post packages, heavy pallets and carload shipments of steel pipe and plate. It complies fully with Army-Navy specifications JAN-P-106A, JAN-P-107, and JAN-P-108 for overseas packing. It assures tight, safe reinforcement from shipping point to destination.

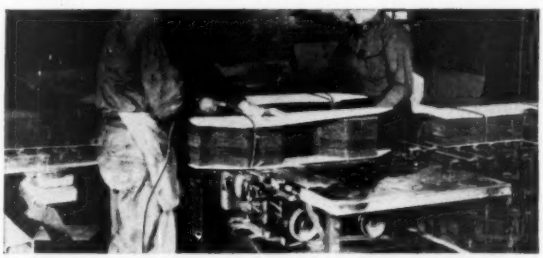
It will pay you to investigate the Gerrard Method of Strapping for possible savings to your tying operations. Contact a Gerrard engineer for the latest information. His advice on packaging problems is available free of charge. Write for a free copy of the *Blue Book of Packaging*.



Diesel engine crankcases are palletized for inter-plant movement. 3000 lb. load is firmly secured with 2 Gerrard Straps. (Photo courtesy International Harvester Company, Industrial Power Division.)



Three Gerrard Steel Straps give secure reinforcement to box of oil well machinery. Every Gerrard machine tensions, ties and cuts the strapping quickly and efficiently. Separate seals are not needed.



With Model Q semi-automatic machine, asphalt shingles are quickly bundled from the conveyor. Operator drapes Gerrard Strapping, presses thumb lever; machine tensions, ties and cuts strapping, and resets itself for next operation.

**U·S·S GERRARD ROUND STEEL STRAPPING**

GERRARD STEEL STRAPPING DIVISION, UNITED STATES STEEL COMPANY

USS

UNITED STATES STEEL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# BOOKS

*Begins on page 304*

form of curves. Can be applied to a wide variety of business and industry problems where it is necessary to make time-consuming calculations. By Lee H. Johnson. John Wiley & Sons, Inc., 440 Fourth Ave., New York. 147 pp. $3.75.

**PRINCIPLES OF BUSINESS LAW**

Explains the fundamental principles of business law and shows you how they have been applied in actual cases. Includes several recent developments in the fields of trade regulations and labor law, a glossary of legal terms, and samples of common legal forms. Fifth edition. By Essel R. Dillavou and Charles G. Howard. Prentice-Hall, Inc., 70 Fifth Ave., New York. 978 pp. $8.65.

**LEAD IN MODERN INDUSTRY**

The only book currently available devoted exclusively to the manufacture, applications, and properties of lead, lead alloys, and lead compounds. Gives you a handy reference source and may help you determine more readily whether lead has properties that can help you. Illustrations, charts, tables. Lead Industries Assn., 420 Lexington Ave., New York 17. 230 pp. $1.50.

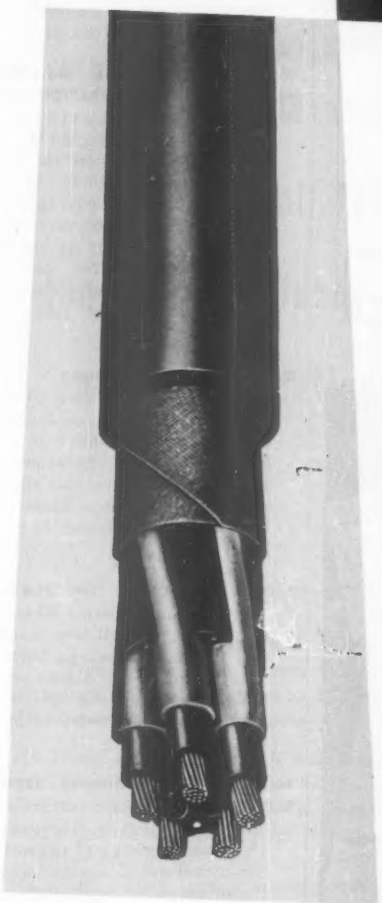
**ELECTRON TUBES IN INDUSTRY**

Tells you what can be expected of electronic devices and what their limitations are—a good assist in visualizing new applications. Minimum of complicated theory, but you can dig deeper with the help of extensive references. By Keith Henney and James D Fahnestock. McGraw-Hill Book Co., 330 W. 42nd St., New York 36. 353 pp. $6.

*Turn the page*

Aging characteristics of RoZone compounds, highly important to the life of the cable, are constantly checked by means of oxygen "bomb" and long-time heat tests.

5-conductor control cable RoZone insulated, Neoprene sheathed, outer sheath of RoPrene (Neoprene)—600 volts.



# Rome RoZone®

## Superior Ozone-Resistant Insulation Deserves Your CONFIDENCE

### What its Excellent Aging Characteristics Mean to You

**Q: Why have oil base compounds been recognized as superior for over half a century?**

**A:** Partly because of excellent moisture and ozone resistance, but particularly because of their resistance to natural aging effects. Such cables are still operating satisfactorily today.

**Q: How do we know that RoZone oil base compound has superior aging characteristics?**

**A:** First, because it exceeds industry specification requirements. Second, because this type formulation has been time proved for over fifty years.

**Q: Are the applications of RoZone limited by its aging qualities?**

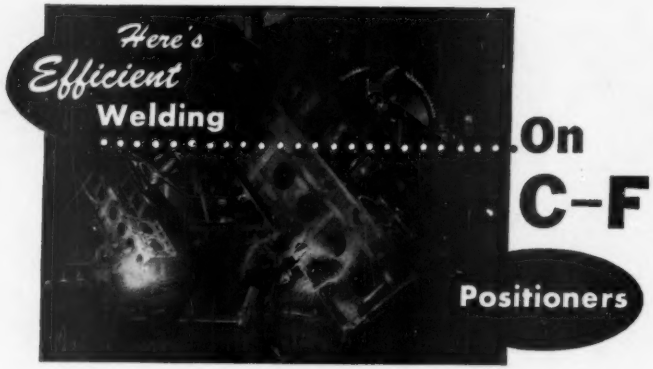
**A:** No. RoZone insulated cable can be used in practically any application because of its excellent aging properties. It is successfully installed direct in earth, in conduit, in racks, overhead and in combination runs.

In any installation where exceptional resistance to aging, corona and ozone cutting plus low dielectric loss and excellent electrical stability in water are required, Rome RoZone deserves your confidence.

***It Costs Less to Buy the Best***

*RoZone is approved and accepted by leading utilities, industrials and consulting engineers.*

ROME CABLE
*Corporation*
ROME • NEW YORK
*and*
TORRANCE • CALIFORNIA




When heavy, unwieldy weldments like these diesel crank cases can be quickly swung into any position so that every weld is made downhand—that's efficient welding!

Welders spend more time welding—do better welding at lower cost when they work with C-F Positioners because these hand and/or power operated machines reduce positioning time to a minimum. Investigate the cost-saving advantages of C-F Positioners. They pay their way in any company.

*Write for Bulletin WP24—an illustrated circular detailing the specific advantages of C-F Positioners.*

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1321 S. KILBOURN AVENUE CHICAGO 23, ILLINOIS

*NEW 20 PAGE*

# PACKING CATALOG for All MAINTENANCE NEEDS

**The PC-102 Palmetto Packings Catalog**

**Contents —**

- **APPLICATION, PERFORMANCE and STRUCTURAL DATA** on all Palmetto Self-lubricating, Molded, and Sheet Packing — *including Palmetto's new Teflon packings.*
- **SIMPLE, COMPREHENSIVE APPLICATION CHART** for easy selection of correct self-lubricating packing to suit the packing need. Handy ordering tables give full dimensional, packaging data.
- **PHOTOGRAPHS, DIAGRAMS and CUTAWAY VIEWS** further aid in making this new Palmetto Packings Catalog an efficient guide for maintenance personnel-in choosing and obtaining packing requirements.

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*packing more performance into every application*

**GREENE, TWEED & CO.**
North Wales, Pennsylvania


For copies of books and booklets reviewed, write directly to publisher listed

# BOOKLETS

*Begins on page 304*

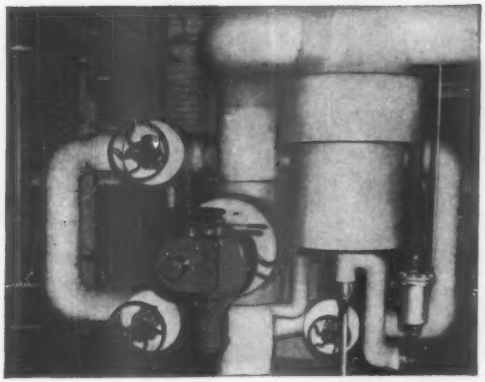
**EXTINGUISHING OIL TANK FIRES BY AGITATION.** By J. L. Rishinger, Safety and Fire Protection Supervisor, Socony - Vacuum. National Fire Protection Assn., 60 Batterymarch St., Boston 10. The results of successful research on extinguishing oil tank fires by air. 14 pp. 35¢.

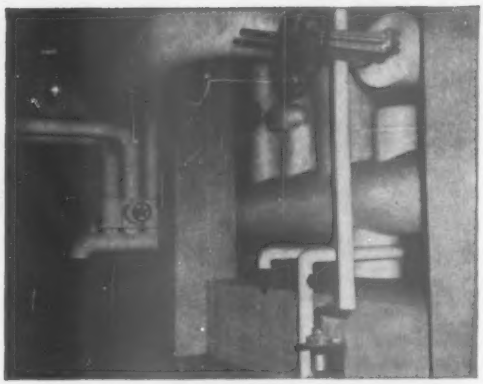
**STANDARDS FOR THE MAINTENANCE AND SAFE OPERATION OF INDUSTRIAL TRUCKS.** National Fire Protection Assn., 60 Batterymarch St., Boston 10. Do your industrial trucks buzz back and forth in your plant like carnival Dodgems? If they do, get a copy of these recommendations for better maintenance and safer operation—before it's too late. 10 pp. 25¢.

**MALLEABLE IRON CASTINGS.** Albion Malleable Iron Co., Albion, Mich. What you should know about malleable iron — its properties and characteristics. Includes data on yield and tensile strengths. Illustrations, charts, and tables. 15 pp. Free.

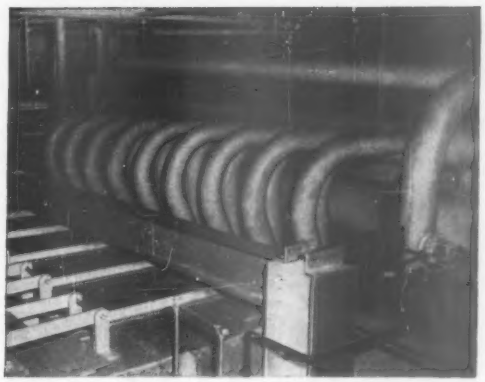
**STORY OF MODERN TIN PLATE.** Wheeling Steel Corp., Wheeling, W. Va. A well-illustrated tour through Wheeling's Yorkville, Ohio, works. Shows you how hot-dipped and electrolytic tin plate is made. 16 pp. Free.

**WELDING WITH STAINLESS STEEL ELECTRODES.** Lincoln Electric Co., 22801 St. Clair Ave., Cleveland 17. Covers welding of chromium-nickel steels, together with complete procedures. Gives you AWS and ASTM classifications of corrosion-resisting chromium and chromium-nickel steel welding electrodes (Specification A298-48T). 32 pp. 25¢.





# High temperatures call for the high efficiency of K&M insulations



One of the most efficient combinations for insulating equipment with temperatures up to 1900° F. consists of K&M "Featherweight" 85% Magnesia and Hy-Temp Insulation.

Hy-Temp Insulation, which has exceptional heat-resisting qualities, is applied directly to the hot surface. When a sufficient thickness is used, the temperature of the insulation's outside surface can be brought to 600° F. or lower. "Featherweight" 85% Magnesia, which has a higher insulating value, is then applied directly over the Hy-Temp Insulation. Thus, the special qualities of both materials are effectively used.

Your K&M distributor, an experienced applicator, will gladly answer your questions about these products. Or, write to us for complete information.

K&M
Last in asbestos

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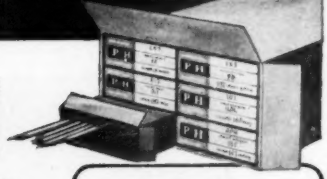
COMPANY • AMBLER • PENNSYLVANIA

THE P&H MAINTENANCE PACK PUTS THE RIGHT ROD FOR THE JOB AT YOUR FINGERTIPS!

**Handy, small-package assortment of electrodes for repair and maintenance welding**



# NEW P&H Maintenance Pack

You no longer have to buy seldom-used rods in quantities larger than you need. For now, with the new P&H Maintenance Pack, you can keep some of each type on hand economically — and get replacement packages as you need them.

There are five different kinds of electrodes included in the P&H Maintenance Pack. It equips you to do all kinds of repair and maintenance jobs — and get fast, easy, sound welds. All rods are packaged to stay dry — and are clearly identified to make proper selection easy.

Be ready to meet every emergency. Save time, trouble, and money. Order a P&H Maintenance Pack from your P&H representative or local distributor. Mail coupon for name of one nearest you, and for further information.

**$13.50**

**for complete assortment of five different kinds of electrodes (Approximately 27 lbs.)**

1. AC-3, 1/8", 5/32", 3/16" — For all position welding of mild steels and sheet metal. AC or DC.
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**"FREEDOM AND POWER"** shows how personal freedom and electric power work together for national welfare and security. It traces early American history and the growth of the power industry. Scenes show the use of power in industry. Color, sound. Runs 29 minutes. Write:

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**"METALLIZING—ITS APPLICATIONS"** is a 28-min. film that shows some of the many maintenance and production applications for metallizing. Sequences describe the process in use in a variety of plants, and demonstrate the latest methods of surface preparations on such equipment as tanks, trestles, degreasers, and damaged machine parts. For free showing, write:

*R. J. McWaters, Metallizing Engineering Co., Inc., 38-14 30th St., Long Island City 1, N. Y.*

**"MOBILIZED PIPE CLEANING"** shows scenes from the Kansas flood of July 1951 and describes pipe-cleaning operations necessary afterwards. Runs 21 minutes. For free showing, write:

*Ace Pipe Cleaning Contractors, Inc., 2003 Indiana Ave., Kansas City, Mo.*

**"THE LEGEND OF DAN AND GUS"** tells the business stories of two brothers: One organizes a doorknob company, the other establishes a natural gas company—but both have to meet problems of supply and demand, franchise controls, and profit management. How they do it points up the difference between their two types of businesses. Color, 26 minutes. Write:

*Modern Talking Picture Service, Inc., 45 Rockefeller Plaza, New York 20.*

*Turn the page*

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These are facts that should interest every manufacturer:

1.—More than 30 percent of the cost of the average manufactured product comes from handling expenses.

2.—Handling adds nothing to the value of the product.

3.—Reducing handling costs is the one way to lower product costs without sacrificing quality.

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There are Powell representatives serving the 54 largest industrial areas in the nation. For the name of the one nearest you check the yellow pages in your phone book or write direct. He'll be happy to give you the benefit of his wide experience with no obligation whatsoever.

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**THE POWELL PRESSED STEEL CO., HUBBARD, OHIO**

ORIGINATORS OF ALL STEEL COLD FORMED MATERIALS HANDLING EQUIPMENT

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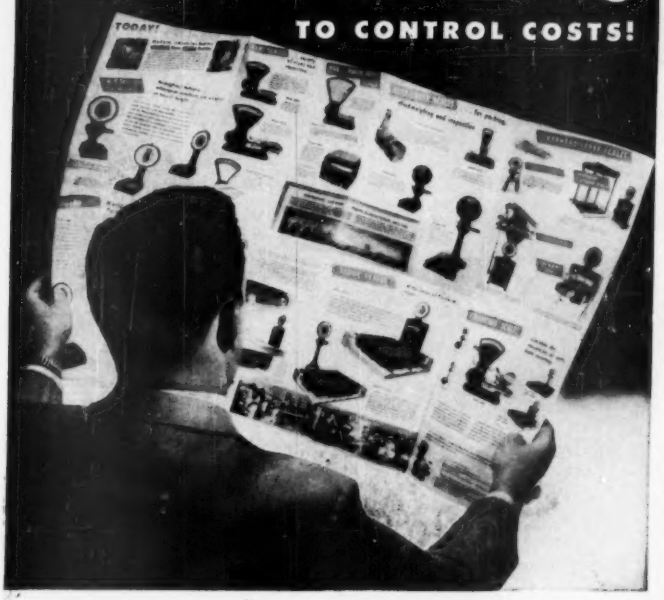
NEW IDEAS

TO CONTROL COSTS!

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Whatever your problems in weighing, checking, testing, counting, batching, force-measuring and other weighing operations . . . there's a modern Toledo to do the job with high *accuracy, speed* and *dependability.* Have you checked your scale needs? Get latest information in this widely used reference on Toledos that help you guard costs . . . speed production. Look into the advantages of Printweigh in stopping losses that originate through human errors. Send coupon for new edition—"Toledo, Headquarters for Scales."

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# INDUSTRIAL FILMS NOW AVAILABLE

*Begins on page 312*

**A GUIDE TO AUDIO-VISUAL MATERIALS** is a 56-page catalog of films on industrial and labor relations. Complete information on selected films in such fields as economics, human relations, safety, steward training, and supervisory training. Price: to residents of New York State, free; to others, 25¢. Write:

*Distribution Center, School of Industrial & Labor Relations, Cornell University, Ithaca, N. Y.*

**OCCUPATIONAL HEALTH** is a 24-page catalog that lists 100 films on industrial health and related subjects. Free. Write:

*Federal Security Agency, Public Health Service, Div. Occupational Health, Washington 25.*

# FILM PROGRAM OF THE MONTH

## AUTOMATION

*The following films have been selected to supplement the information presented in "Ford's Automated Engine Plant" (page 93). Why not use them as part of your training program on automation?*

**"INFORMATION AT WORK"** describes the application of controlled processing instruments in five industries. Gives an elementary explanation of variables measured by industrial instruments. Could be used to give workers a better understanding of industrial instrument use. 33 minutes, color, sound. Write:

*Taylor Instrument Co., Public Relations Dept., 95 Ames, Rochester 1.*

*Turn the page*

# CORRUGATED *Asbestos* TRANSITE*

**FOR THE FACTORY**

Because it is practically indestructible, Johns-Manville Corrugated Transite is extensively used in this plant to provide a durable, trouble-free exterior.

**FOR THE FARM**

This large barn is typical of the excellent use of Johns-Manville Corrugated Transite on farms where it helps eliminate the threat of loss from fire, destructive rot, and vermin.

## You build economically and quickly with these versatile fireproof and weatherproof asbestos building sheets

In the past quarter century, Johns-Manville Corrugated Transite has proven an ideal material for roofs and for sidewalls of industrial, commercial, institutional and agricultural buildings. Made of asbestos and cement, the large sheets are easy to handle, go up quickly with a minimum of framing. Practically indestructible, Corrugated Transite is fireproof, rotproof, weatherproof; needs no paint or special treatment to preserve it; and can be salvaged and re-used if necessary.

The streamlined corrugations and attractive shadow lines of J-M Corrugated Transite have great architectural appeal . . . creating a contemporary effect in keeping with today's growing requirements for functional beauty inside as well as out.

Investigate J-M Corrugated Asbestos Transite and learn how you can build quickly and easily . . . have an attractive, long-lasting, trouble-free structure regardless of size or purpose. For complete details write Johns-Manville, Box 158, Dept. FM, New York 16, N.Y. In Canada write 199 Bay Street, Toronto, Ontario.

*Reg. U. S. Pat. Off.

EASY TO FASTEN TO STEEL

EASY TO SAW

EASY TO DRILL

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**Let Strom Help You**

Not only in precision ball bearings, but in countless other places, Strom has found that the right ball will do the job better. Maybe your problem can be solved with the use of the proper ball. Why not take it up with Strom.

Strom has been making precision metal balls for over 25 years for all industry and can be a big help to you in selecting the right ball for any of your requirements. In size and spherical accuracy, perfection of surface, uniformity and dependable physical quality, there's not a better ball made.

**Strom STEEL BALL CO.**
1850 So. 54th Ave., Cicero 50, Illinois
Largest Independent and Exclusive Metal Ball Manufacturer

Here is one of the newest coolers in the Halsey Taylor line—designed for long life and faultless service, with its gleaming stainless steel top and distinctive Halsey Taylor health-safe advantages. It's a stand-out in coolers . . . but just one of the many made by Halsey Taylor for office, or plant use! Write for literature.

**HALSEY TAYLOR**
*Coolers*

F-20

THE HALSEY W. TAYLOR CO. WARREN, OHIO

SEE OUR CATALOG IN SWEET'S

# FILM PROGRAM OF THE MONTH

*Begins on page 312*

**"SPECIAL MACHINERY FILM NO. 1"** demonstrates the application of transfer machinery to production of two types of automotive transmission parts. The film follows the progress of the workpiece through five complex transfer machines, showing the unusual fixtures that tilt, rotate, and tip the workpiece during machining. Also spotlights other details of transferring, clamping, and machining. Sound, 18 minutes. Write:

*Special Machinery Sales Dept., Greenlee Bros. & Co., Rockford, Ill.*

**"USES UNLIMITED"** shows the uses of the microswitch as a control device for both heavy and light machinery in many industries. Explains how the microswitch is made, and emphasizes safety factors in its use as a control. Of interest to mechanics, engineers, and process engineers. 32 minutes, sound color. Available free from:

*Microswitch, Freeport, Ill.*

**"PRINCIPLES OF AUTOMATIC CONTROL"** is an illustrated lecture on the needs, functions, and uses of automatic control devices. You watch control mechanism operation on many types of plant equipment. Could be used effectively to explain automatic-control operation to foremen and other plant people. 51 minutes, color, sound. Available free from:

*Instrument Society of America, 921 Ridge Ave., Pittsburgh 12.*

**"MOTORS IN INDUSTRY"** tells how industry has progressed steadily from hand operation to continuous process. You learn from a methods engineer how mechanization can apply to your industry. Color, sound, 27 minutes. Write:

*Distribution Section, Advertising & Sales Promotion Div., General Electric Co., Schenectady 5, N. Y.*

# Only lighting units that can meet or exceed approved standards of quality bear this

# RLM LABEL

**...and here are these STANDARD SPECIFICATIONS in the up-to-date, enlarged edition of the**

**NEW RLM SPECIFICATIONS BOOK**

This new, greatly-enlarged RLM Specifications Book contains complete RLM Specification data on a total of 68 types and sizes of fluorescent, incandescent and mercury industrial lighting units. One or more of these units—conforming to RLM quality specifications and certified to bear the RLM Label—is offered by each of 26 manufacturers.

The RLM Label affixed to a lighting unit is a Certificate of Assurance. It assures the buyer that the equipment meets or exceeds certain quality standards established by the RLM Standards Institute and published in its 48-page Specifications Book. Further, it provides a Warranty of Uniform Quality . . . a guarantee that every RLM-Labeled Unit off each manufacturer's assembly line will conform constantly and continuously—will never waver below these standards.

You can rely on this Warranty. It is upheld by the extensive RLM Inspection and Certification Program—the real backbone of the RLM Label. As fully explained in the RLM Specifications Book, periodic inspections are made by an independent testing laboratory. Lighting units are checked for conformance to RLM standards as they come off assembly lines, as well as at all levels of distribution.

Send for your COMPLIMENTARY COPY of the RLM Specifications Book. Long recognized as an authoritative aid to everyone who buys, sells, specifies or installs industrial lighting equipment, this enlarged 1952 edition includes coefficients of utilization tables and light distribution curves to make it even more helpful. It puts the whole story on the 68 different RLM Lighting Units right at your fingertips. Your copy of the new edition, RLM Specifications Book is available without cost or obligation. Address your request to: RLM STANDARDS INSTITUTE, Suite 829, 326 W. Madison St., Chicago 6, Illinois.

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R4084

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**HOLDS THE ANSWER TO YOUR FLOOR AND WALL TILE NEEDS!**

## TILE-TEX* ASPHALT TILE

A quality, low-cost composition tile that combines decorative beauty and workhorse durability with low initial cost, minimum maintenance and long, long service life.

Comes in 28 rich plain or marbleized colors.

Accurate cut of tile makes joints tight, and lines straight. Its smooth surface makes cleaning easy. No place for dirt to cling.

Ranks high in fire resistance due to its asbestos content.

Readily adjusts to average sub-floor contours at or below grade. Quickly, economically installed.

## TUFF-TEX* GREASEPROOF TILE

It's the greaseproof tile for industry. Gives the economy every plant operator wants. Combines high impact resistance with remarkable flexural strength. Withstands constant traffic of heavy materials handling trucks. Offers unusual color and versatility of design . . . either decorative or functional.

Use Tuff-Tex in traffic aisles . . . with built-in safety markers that can't wear off.

Use it in machine areas . . . lubricants, and metal chips can't hurt it . . . in plant food serving areas for kitchen or cafeteria floors.

## FLEXACHROME* VINYL—PLASTIC ASBESTOS TILE

The *ultimate* in resilient composition tile. Richly colorful. Highly resistant to acids and alkalies. Completely greaseproof. Extremely easy to clean because of its extra dense surface. Waxing is not necessary.

When it comes to beauty, Flexachrome's 25 brilliant colors are unsurpassed. And its wide range of sizes combine to give you almost unlimited design versatility.

Combining the advantages of ALL types of resilient flooring, Flexachrome is widely used over wood sub-floors. It proves ideal for many areas subject to special abuses, as well as where bright color contrast or a high degree of light reflectancy is desired.

## VITACHROME† RESILIENT FLOOR TILE

Offers a choice of *especially light, bright* colors . . . and high light reflectancy. It's extremely durable . . . grease and oil resistant.

*Plus* . . . initial low cost. *Plus* . . . ease and quickness of installation. *Plus* . . . low maintenance. *Plus* . . . ease of cleaning.

Ideal wherever inexpensive, durable and decorative floors are required.

## MURA-TEX* PLASTIC-ASBESTOS WALL TILE

Looking for *washable* tile walls that combine decorative beauty with practical durability? . . . Mura-Tex is your lifelong friend.

Here's a wall treatment that is truly modern, featuring color tones that blend perfectly with today's decorating schemes.

Mura-Tex is quickly installed over new or old plaster, or properly built dry wall construction.

It's a popular tile for wainscoting halls, corridors, and utility rooms; and is particularly suited to walls of powder rooms, bathrooms, and kitchens.

Visit your Tile-Tex Contractor's display room. He'll show you all the different colors, sizes, textures . . . show you how tile-at-a-time installation makes possible unlimited designs, lowers maintenance, repair and alteration costs.

You'll find his name in the classified pages of your telephone directory. Or write us for his name and address.

THE TILE-TEX DIVISION, The Flintkote Company, 1234 McKinley Street, Chicago Heights, Illinois.

Tile-Tex—The Pioneer Division, The Flintkote Company, P. O. Box 2218, Terminal Annex, Los Angeles 54, California.

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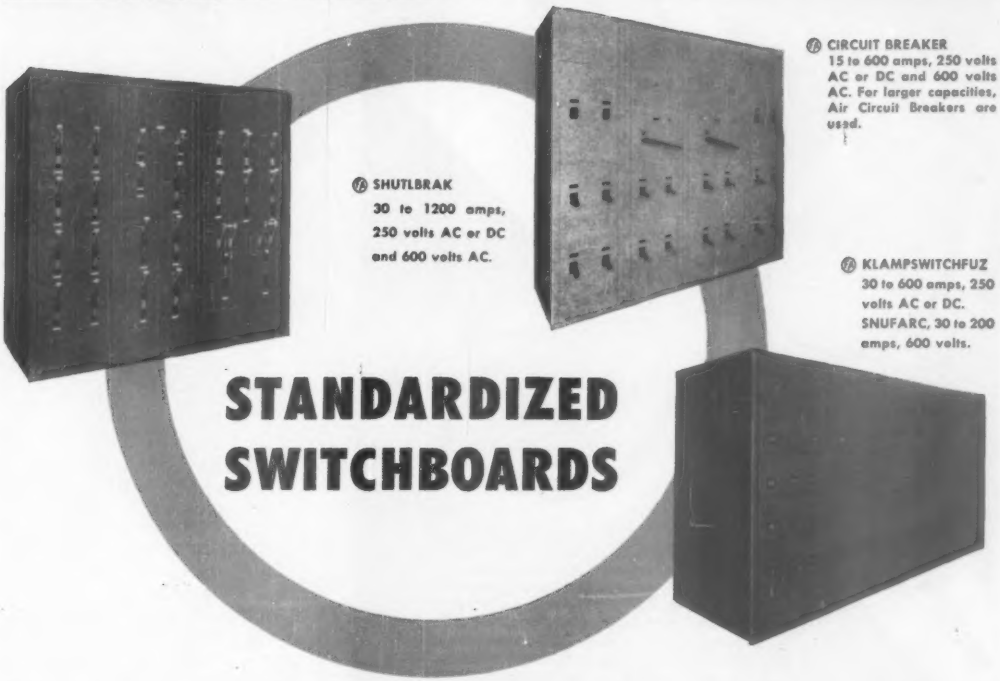

FA SHUTLBRAK
30 to 1200 amps, 250 volts AC or DC and 600 volts AC.

FA CIRCUIT BREAKER
15 to 600 amps, 250 volts AC or DC and 600 volts AC. For larger capacities, Air Circuit Breakers are used.

FA KLAMPSWITCHFUZ
30 to 600 amps, 250 volts AC or DC. SNUFARC, 30 to 200 amps, 600 volts.

## STANDARDIZED SWITCHBOARDS

STANDARDIZED FA SWITCHBOARDS are noted for their efficiency, safety, and dependability.

Built of standardized pre-assembled units, incorporated in standardized enclosures, these sturdy, long-lasting and trouble-free power centers embody the latest features of design and operation.

Standardized FA Switchboards are of three types — the **Shutlbrak,** a safety type switchboard designed for frequent operating use; the **Klampswitchfuz and Snufarc,** which features a dependable hinged type, pull-out switch unit for disconnect service on lighting and power circuits, and the **Circuit Breaker,** another safety type, featuring the latest developments in automatic circuit protection.

All Standardized FA Switchboards are factory assembled and shipped ready for connection to main and branch circuit cables. Units can be arranged singly or grouped because all sections fit readily together. Removable end walls permit the addition of sections on either side.

Want to know more about these efficient, long-lasting power centers? Your nearest FA representative listed in Sweet's will be glad to give you complete information.

## Frank Adam Electric Co.

P. O. BOX 357 ST. LOUIS 3, MISSOURI

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*Makers of* BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKHETER

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dependable
eye protection
keeps you on the safe side
WILLSON SAFETY EQUIPMENT
Combined protection, comfort and appearance make Willson safety spectacles outstanding in value. Choose from a full range of metal and plastic frames—fitted with Super-Tough* heat-treated glass lenses, or Plas-Tough* plastic lenses—every one tested for impact resistance and optical quality. Send for catalog describing our complete line of safety equipment.
STYLE AH
METAL FRAME Latest style spectacle with single bridge. Have Hi-Line temples with a "dressy" look. Also available with side shields. (Non-flammable plastic frame Style WKS shown at top.)
CHOOSE YOUR FAVORITE LENSES FOR ANY WILLSON SPECTACLES
SUPER-TOUGH*
WILLSONITE®
PLAS-TOUGH*
Three popular types of lenses are available for all Willson Spectacles. Clear glass Super-Tough*, Willsonite® Green Super-Tough* and the new Plas-Tough* lenses that combine the impact resistance of heat-treated glass with the comfort of lightweight plastic.
*Trademark

*See your WILLSON distributor or write for Catalog*

**WILLSON PRODUCTS, Inc., 218 Washington St., Reading, Pennsylvania**


# BEHIND THE BYLINE

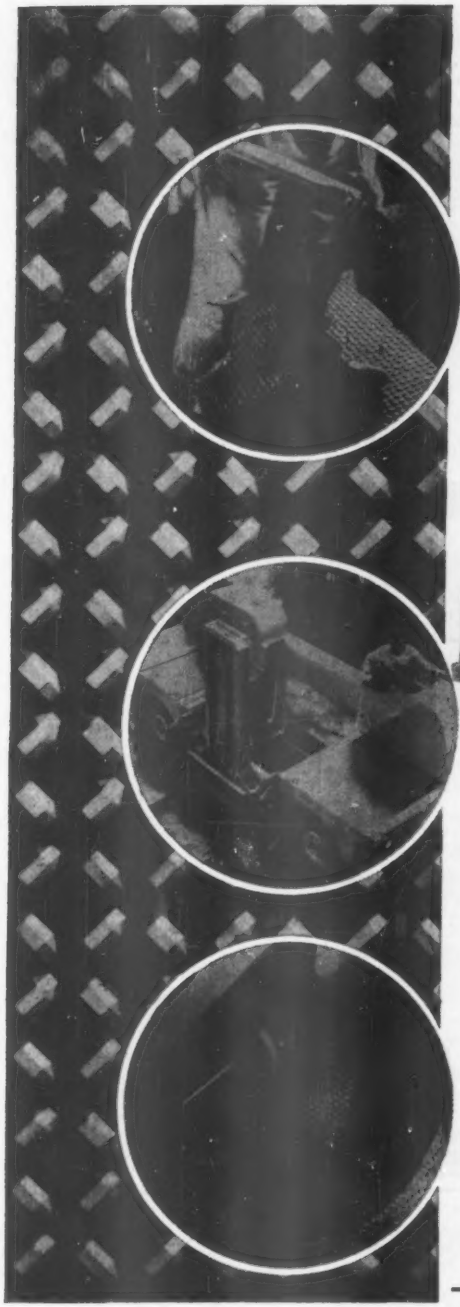
*Meet some of the men in industry who wrote articles for this issue of FACTORY.*

**EDWARD H. FREEDMAN,** who has been active for more than 30 years in creative commercial art, is president of Kent Studios Service, Inc. See page 84. You may want to read his *Conversational Drawing.* (Farrar, Straus & Co., $2.75).

**CHARLES A. BOGENRIEF** tells how to use work sampling in cost control (page 113). He's been with Grayson Controls Div., Robertshaw-Fulton Controls Co., for 15 years, the last 10 as head of industrial engineering.

**ERNEST MELLINGER** came to Ryan Aeronautical Co. 12 years ago. He started as a tool and die maker, worked up through all tool and tool planning categories. Today he's assistant superintendent of production engineering (page 136).

*Turn the page*



*'Cause Multigrip makes footing safe*
*This man has forged ahead;*
*He used to have to watch his step . . .*
*Now minds his work instead!*

*And Multigrip is gutter-free,*
*Won't trap a narrow wheel.*
*For safety's sake use Multigrip,*
*Produced by U. S. Steel!*

●**USE MULTIGRIP** where sure-footing is essential. It will help reduce accidents caused by slips and falls, and resultant lost man hours. It will help increase operating efficiency, for the flat-topped, sloping-edged risers of Multigrip are comfortable to work on, comfortable to walk on . . . tend to lessen fatigue.

Vehicles roll easily, safely on Multigrip Floor Plate. It provides maximum traction for stopping, starting . . . pushing, pulling. There are no gutters to catch a wheel. Multigrip is economical, too. Installations are permanent, reducing plant maintenance costs. It's easily cleaned . . . drains freely in all directions.

UNITED STATES STEEL COMPANY, PITTSBURGH
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, CHICAGO
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

**U·S·S**
# multigrip
**FLOOR PLATE**

USS

*Sold by leading distributors from coast to coast*

2-1422

UNITED STATES STEEL

"Here's How We Keep This Asphalt Tile Floor Beautifully Clean at....

**¼ the FORMER MAINTENANCE COST"**

Picture shows floor nearly 10 months after the first ONLY application of Multi-Clean Asphalt Tile Preserver.

WITH THE MULTI-CLEAN METHOD

"We used to wax this floor on an average of twice a month; now we apply Multi-Clean Asphalt Tile Preserver only once a year and always have a clean, beautiful, non-slip floor," says the floor maintenance director at Griggs, Cooper & Co., St. Paul, large midwestern food processing firm.

THE MULTI-CLEAN METHOD on this company cafeteria floor is saving between 15 and 20 hours of maintenance time a month, and material costs have been cut from $200 a year to $30. The floor, which is 6 years old and in constant daily use, has been given a new look and longer life with Multi-Clean Asphalt Tile Preserver.

Ask the maintenance men and they'll tell you, it's easier now to keep the floor clean and control scuff marks. The daily routine of sweeping, wet mopping and polishing with a brush under a Multi-Clean floor machine has not been changed, they say, but, "the dirt comes up easier and the floor stays clean longer." Once a week the floor is burnished with a steel wool disc under the floor machine to eliminate scuff marks and restore the original color and beauty to the surface.

Want to hear more about this amazing floor treatment . . . how it will beautify your floors and save you money in your floor maintenance program? Just fill out and mail the coupon . . . Do it now!

**The Multi-Clean Method** is a planned and tested procedure including the use of proper materials and equipment with their correct application for all types of floors and floor conditions.

Every Multi-Clean Product carries a 100% Guarantee!

**FREE! FLOOR MANUALS**

Each for the proper care of a specific floor. Check the coupon for the manuals of your choice.

MULTI-CLEAN® PRODUCTS, INC.

MULTI-CLEAN PRODUCTS, INC.
2277 Ford Parkway • Dept. FM-12, • St. Paul 1, Minn.
Gentlemen—I would like to know more about the Multi-Clean Method for my floors. Send manuals I have checked.

☐ ASPHALT TILE ☐ CONCRETE ☐ RUBBER TILE
☐ WOOD ☐ TERRAZZO ☐ LINOLEUM
☐ 5-JOB FLOOR MACHINE ☐ WET-DRY VACUUM ☐ ALL-PURPOSE SCRUBBER

Name_____
Address_____
City_____ Zone____ State_____
6-51

# BEHIND THE BYLINE

*Begins on page 320*

**MICHAEL F. BIANCARDI,** who writes about hearing tests (page 110) is manager of the health and safety department at Allis-Chalmers Mfg. Co. He has been with the company since 1940, was promoted to his present spot in 1947.

**DR. PAUL J. WHITAKER** co-authored the article on page 110. Since 1951 he has been industrial medical director at West Allis Works, Allis-Chalmers Mfg. Co. He's an M.D. and a Doctor of Industrial Medicine. He was a flight surgeon during World War II.

**WILLIAM H. MINOR** has been in and out of uniform twice. In service he specialized in electronics and research. As a civilian he's taught college physics, later accepted a post as Training Officer, Warner Robins Air Material Area. Writes about training higher skills, page 288.

*Turn the page*

PUTTING *Air* TO WORK FOR R. P. SCHERER CORP.

Each machine produces up to 1,000,000 gelatin capsules a day, and controlled atmosphere is a "must" to assure dependable production schedules.

## KEEPING CAPSULES IN CADENCE FOR
# 9 TROUBLE-FREE YEARS

Capsules . . . capsules . . . capsules—name your size, shape and color! They turn out millions a day filled with anything from vitamins and medicine to lighter fluid and insecticide here at R. P. Scherer Corp. in Detroit. But watch out for moisture-laden air. Until they're dried, these soft gelatin containers are regular little water magnets.

**The answer?** Rigid, unvarying control of temperature and humidity 24 hours a day, seven days a week! It takes really dependable equipment for these unusual requirements. That's why Westinghouse Air Conditioning was selected.*

**The result?** For nine years their Westinghouse system has operated continuously without a single shutdown caused by mechanical failure. This full-time service equals *forty years* of normal service on an equivalent comfort air conditioning system.

Whatever your process involves in the way of a controlled climate, we can help you *put air to work* with air conditioning, air cleaning and air handling equipment. Call the Westinghouse Air Conditioning Distributor listed in the Yellow Pages, or write to Westinghouse Electric Corp., Air Conditioning Division, Hyde Park, Boston 36, Mass.

*Installed by Mechanical Heat & Cold, Inc., Detroit, Michigan

Heads, end bells and side plates have not once been removed since installation in 1942 despite a continuous service record totalling 54,000 hours.

Controlled air supplied to each capsulating machine insures the absolute uniformity of product that is required.

YOU CAN BE SURE...IF IT'S

# Westinghouse

AIR CONDITIONING

J-80253

*Tune in TV's top dramatic show . . .*
**WESTINGHOUSE STUDIO ONE . . .**
**on CBS every week.**

DESIGNED
for
LONGER SERVICE

DARNELL
CASTERS

*Built-in quality assures a long life of efficient service—it pays to "Demand Darnell Dependability".*

SAVE EQUIPMENT
SAVE FLOORS
SAVE MONEY
and TIME

DARNELL CORP., LTD.
DOWNEY, (Los Angeles County) CALIF.
60 Walker Street, New York 13, N.Y.
36 North Clinton, Chicago 6, Illinois

# BEHIND THE BYLINE

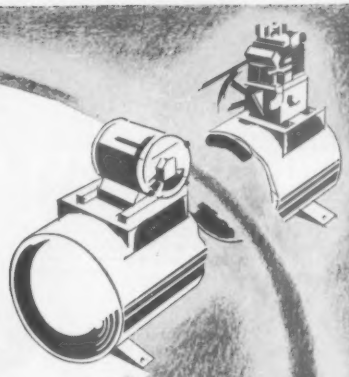
*Begins on page 320*

**WALTER MELTON** has been assistant personnel manager at Columbia-Southern Chemical Corp. since the opening of the Lake Charles, La., plant in 1947. His article (page 131) tells you how the company checks the value of its employee-testing.

**MARY TYDLASKA** (Mrs.) co-authored the article with Walter Melton (page 131). She's a psychometrician in Columbia-Southern's personnel department where she's analyzed batteries of pre-employment selection tests since 1947.

**WILLIAM W. EATON** heads up the management consultant firm bearing his name. He's had almost 20 years' background in plant management, engineering, and research. For his article on rating yourself and your company, see FACTORY for November, page 148.

# DON'T BUY HALF A COMPRESSOR!



## GET FULL-RATED GUARANTEED OUTPUT WITH WAYNE

When you buy a Wayne two-stage Air Compressor, you are *guaranteed* an actual usable air output to meet your individual job requirements not just a theoretical displacement rating. An exclusive flow meter test at the Wayne Plant makes certain every Wayne two-stage Compressor is checked for proper volumetric efficiency, and uninterrupted performance — *guaranteed* to the user.

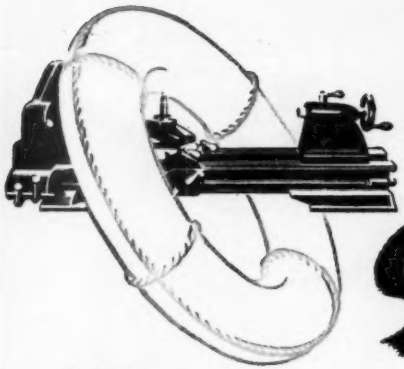
Wayne Compressor construction features include such outstanding advantages as larger flywheel — more cooling capacity; dual intake valves; dual moisture extractors; improved lubrication system; automotive type pistons, and other refinements to give you top performance and long-lasting service.

Next time you buy a compressor, don't buy half a compressor, buy Wayne and get full-rated, *guaranteed* air output to meet your job requirements. Every Wayne Compressor is backed by a nation-wide service organization.

Wayne
AIR COMPRESSOR
Guaranteed
PERFORMANCE!
You have purchased a Wayne Model
Air Compressor, rated at
cu. ft.
All air compressors are rated on their displacement rather than
on the actual (usable) air they produce. In other words, a compressor
rated at 7 .10 or 14 cu. ft. per minute, in reality may deliver but 60%
to 70% of this amount in usable air.
A similar condition exists with automobile ratings. An automobile
manufacturer rates a motor at say, 100 H. P. (theoretical), but in reality
the motor produces but 30 H. P. In air compressors—as in automobile
motors—the actual output is the all-important factor, and in air compressors
only can be determined by an individual water test.
To assure Wayne purchasers of highest obtainable efficiency, each
2 Stage Series Unit is individually tested by this method.
THIS CERTIFICATE
THAT THE ABOVE COMP
WAYNE COMPRESSOR INSPE
OR A ROTAMETER FLOWMETER AN
VOLUMETRIC EFFICIENCY
Wayne
Wayne Humane Measure
for your protection

**THE WAYNE PUMP COMPANY**

SALISBURY, MARYLAND • TORONTO, CANADA



# LIFE SAVING!

**QUICK** ••• economical replacement of worn bearings in machine tools and industrial machinery with Bunting Standard Stock Bearings in 854 sizes.

**EASY** ••• installation of new bronze bearings in electric motors with Bunting Electric Motor Bearings in 324 sizes.

**FAST** ••• economical production of special bronze bearings and parts with Bunting Precision Bronze Tubular and Solid Bars in 263 sizes.

*Bunting Ads win 1st award in contest sponsored by Industrial Distributors Associations.*

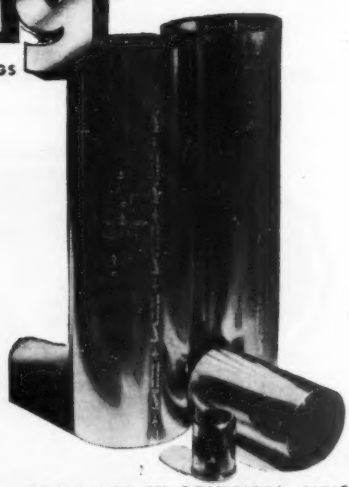
Life of production equipment and machinery is prolonged, and down time avoided by the ease and speed with which Bunting Standard Stock Bearings, Electric Motor Bearings and Precision Bronze Bars can be obtained and employed.

**Bunting®**

BRONZE BEARINGS • PRECISION BRONZE BARS • BUSHINGS

## ...IN STOCK EVERYWHERE

Bunting products are instantly available in all markets, from the stocks of leading industrial distributors and distributors of specialized industrial items. Ask your distributor or write for catalog.



THE BUNTING BRASS & BRONZE COMPANY • TOLEDO 1, OHIO • BRANCHES IN PRINCIPAL CITIES

# DRIVE-IT

## FASTENS WOOD TRIM TO STEEL WINDOWS AT IBM

Wood trim was fastened to the steel window frames with Drive-It at the new IBM plant at Poughkeepsie, New York. Over 20,000 drive pins were used by Stewart-Scott Construction Corp. Drive-It offered the quickest, easiest, most economical method. No drilling, tapping or power lines.

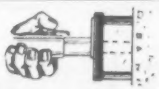
## split-second fastening to concrete steel

**Drive-It uses a small powder load to drive hardened steel pins into concrete or steel. No power lines! No drilling!**

UL

***DRIVE-IT,*** the *first* powder actuated tool approved by Underwriters' Laboratory.

***DRIVE-IT*** cannot be discharged accidentally due to the push and turn sequence. This, plus the large safety pad makes *DRIVE-IT* triple safe.



Exclusive Automatic Barrel Extension for fastenings inside junction boxes or other recesses.

***DRIVE-IT*** is the only powder-actuated tool which requires but one standard power load regardless of penetration desired.

Exclusive Swivel Safety Pad easily rotated for getting into close quarter work.

***DRIVE-IT*** "300", lowest cost fastening tool. Low original cost and low operating cost.

## a drive-pin for every job

**OVER 50 TYPES AND SIZES**

*See our display,* **PLANT MAINTENANCE SHOW,** *Cleveland, January 19-22, 1953.*

**MAIL THIS COUPON TODAY!**

**POWDER POWER TOOL CORP.**

0715 S. W. Woods St., Portland 1, Oregon

Canada: Ammo Power Tool Co., Ltd.
735 Broadway, Vancouver, B. C.

☐ Please send FREE catalogue and literature.
☐ I want a FREE demonstration of *DRIVE-IT.*

Name_____

Street_____

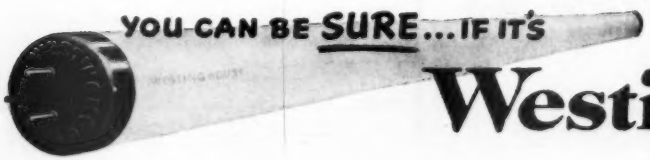
City_____ State_____

# Twins at birth, but not at 60

Like twins, it's hard to tell a Westinghouse fluorescent lamp from any other brand, or from older Westinghouse types. Except for the new Westinghouse bump-base, they all look alike. But as they grow older, the new Westinghouse stays younger longer. At 7500 hours, or about 3½ years of normal use, the new Westinghouse lamps still give you 75% of their original light output.

One reason for this longer life is the chemical phosphors used to coat the inside of the tube. These chemicals are processed and tested to remove life-shortening impurities. This purity also eliminates color distortion and change. The result is a longer, constant brightness throughout the life of the lamp.

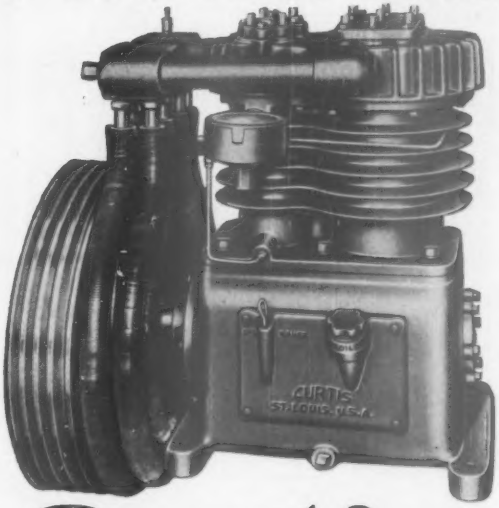
For all the facts, call your Westinghouse Lamp Distributor today, or write to the Westinghouse Lamp Division, Bloomfield, New Jersey.




**Westinghouse**

# MORE AIR Per Horse Power

- IT'S TWO-STAGE
- IT'S AIR COOLED
- SELF OILING



## The New Curtis

**MODEL 98 AIR COMPRESSOR**

**TWO-STAGE AIR COOLED 15 AND 20 HORSEPOWER**

**TWO-STAGE** — More air per kilowatt hour, assuring savings in power bill.

**AIR-COOLED** — No expensive water bills; eliminates plumbing installation costs.

**INTERCOOLER** — Four section, finned, providing unusually effective cooling between stages; cooled by cyclone of air from fan flywheel.

**SELF OILING** — Simple, positive centro ring method; provides pressure lubrication of connecting rod and pistion pin bearings.

**TWO TIMKEN MAIN BEARINGS** — Tapered rollers; provide easy adjustment made externally without dismantling compressor.

**VALVES** — Readily removable as assembled units without removing cylinder head or breaking pipe connections or gasket joint.

**CRANKSHAFT** — Counterbalanced, drop forged — two main bearings — no overhung bearing.

**PRECISION WORKMANSHIP** — Assures long life and minimum maintenance.

**EXPERIENCE** — Backed by 99 years of manufacturing — assures you dependable, troublefree service.

*Available as a simple compressor or base mounted — motor driven.*

**LET ONE MAN DO THE WORK**
with this Curtis air-operated equipment.

**AIR CYLINDERS** — for almost any pushing, pulling or hoisting operation.

**AIR HOISTS** — for low-cost lifting or lowering of materials or machines.

-726

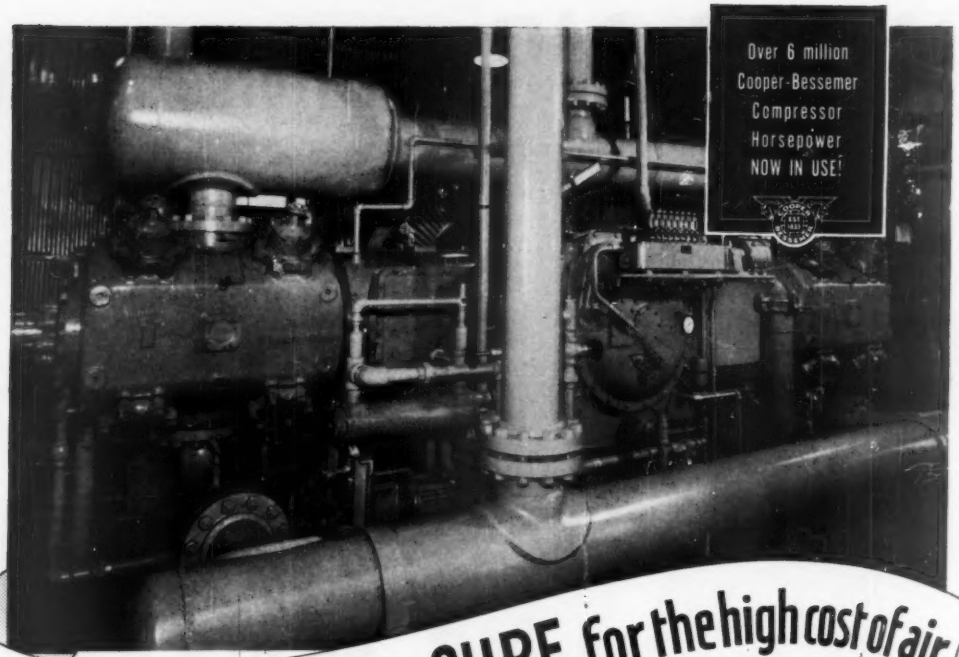
**CURTIS PNEUMATIC MACHINERY DIVISION**
*of Curtis Manufacturing Co.*
1995 Kienlen Avenue, St. Louis 20, Mo.

*I am interested in items checked below:*

☐ THE NEW MODEL 98 ☐ AIR HOISTS ☐ AIR CYLINDERS
☐ AIR COMPRESSOR

Name.....
Firm.....
Street.....
City.....Zone....State.....

**CURTIS PNEUMATIC MACHINERY DIVISION of Curtis Manufacturing Company**
1995 KIENLEN AVENUE ST. LOUIS 20, MO.




# RECOMMENDED CURE for the high cost of air

## . . . Cooper-Bessemer Motor Driven Compressors

IF your plans call for compressed air on a large scale, better have a close look at the savings modern Cooper-Bessemer units offer. Shown here is one of the various types and sizes from 350 to 5000 horsepower. These Cooper-Bessemers offer you exceptionally high mechanical and volumetric efficiencies, *throughout* an extremely broad demand range. With such flexibility and efficiency you can turn out more air per dollar.

What's more, the Cooper-Bessemer units have unmatched compactness among units comparable in flexibility, efficiency and life! Without sacrificing accessibility or ruggedness, you save on space, housing, installation and piping costs.

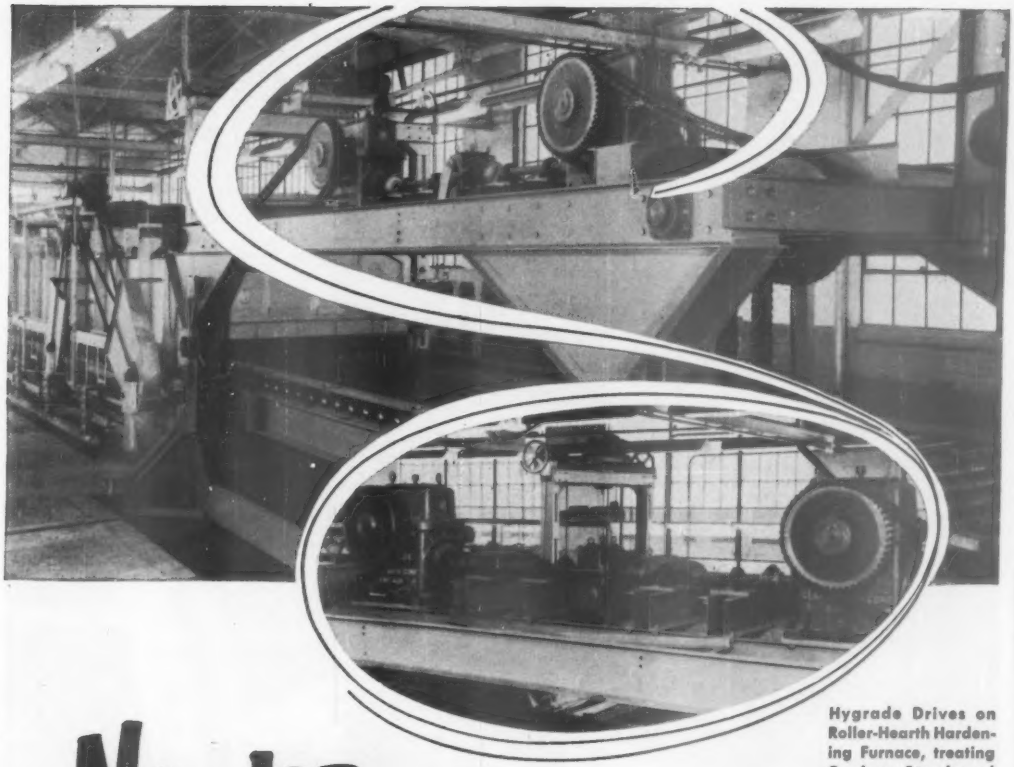
Yes, if you're interested in compressing air, get full details . . . . add up the money-saving facts on these modern units. The nearest Cooper-Bessemer office will be glad to cooperate.

Send for your copy of this new bulletin covering the features, capacities, dimensions, weight, etc. of the Cooper-Bessemer power-driven Type M compressors. 200 to 1,000 hp. Other bulletins covering still larger sizes are also yours for the asking.

*The* **Cooper-Bessemer** *Corporation*

MOUNT VERNON, OHIO — GROVE CITY, PENNA.

New York Washington, D. C. Bradford, Pa. San Francisco Houston, Dallas, Greggton, Pampa and Odessa, Texas Seattle Tulsa Shreveport St. Louis Los Angeles Chicago Caracas, Venezuela Cooper-Bessemer of Canada, Ltd., Halifax, Nova Scotia Gloucester, Mass. New Orleans, La.



Hygrade Drives on Roller-Hearth Hardening Furnace, treating Carbon Steel and Armor Plate, built by DREVER COMPANY, PHILADELPHIA.

# No Job For A Weakling

Handling hot plate is no job for weaklings. This is why the Drever Company chose rugged, powerful Hygrade Drives on this Roller-Hearth Hardening Furnace. These sturdy units not only handle this tough job with ease, but with minimum maintenance.

Wherever you have a speed reduction problem where low cost and rugged dependability are essential, the Hygrade Line of Enclosed Worm Gear Drives offers a solution. Available in a wide range of ratios and h.p. capacities in horizontal and vertical types. Vertical drives are also available with wider low speed bearing span to accommodate long, unsupported output shaft extensions.

FOOTE BROS.

*Better Power Transmission Through Better Gears*

Maxi-Power Drives

Line-O-Power Drives

Foote Bros.-Louis Allis Gearmotors

Foote Bros. Gear and Machine Corporation
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Chicago 9, Illinois

Please send a free copy of Bulletin HGB on Foote Bros. Hygrade Worm Gear Drives.

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Company.....

Position.....

Address.....

City..... Zone..... State.....

# "What would you have done?" asks Mr. George Fehlman

*Executive Vice-President, Belnap & Thompson, Inc., Chicago—merchandise prize incentive programs*

"Recently, we had to deliver prize material to client sales meetings, scheduled all over the country for the same day.

"We were forbidden to ship early—and we *must* not be late! What would you have done?

"We called Air Express.

"Within 24 hours, almost 1,000 shipments were dispatched. All arrived on schedule. Not a single call or wire inquiring about a shipment was received!

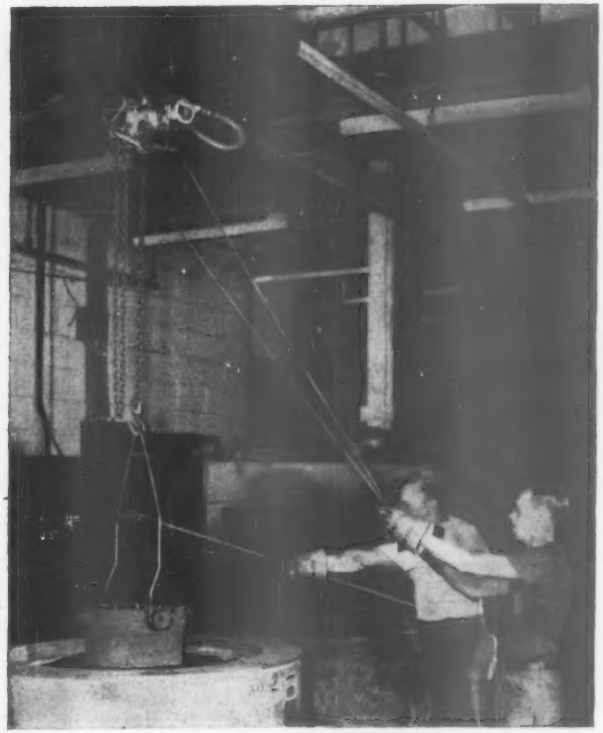
"We've become accustomed to that kind of service from Air Express. What's more—on practically every shipment we make, the Air Express rate is *lowest* in the field. These rate differences often save several hundred dollars in one day's shipping!

"Our business has grown from $4\frac{1}{2}$ million yearly sales 5 years ago, to more than $9 million this year. We give credit for an important 'assist' to Air Express!"

**AIR EXPRESS**

**GETS THERE FIRST**

*Division of Railway Express Agency*
*1952—our 25th year of service*



# LIFTS 1000 POUNDS
# at 20 feet a minute

## ... or 500 pounds at 42 feet a minute

- This latest CP AIR HOIST — with variable speed, rotary vane air motor — spots loads accurately, quickly; sets them down gently.
- New design, trouble-free throttle valve provides sensitive control from an almost imperceptible creep to full speed.
- Air motor cannot overheat — no shock hazard — no spark hazard — no switches to maintain.
- Self-locking worm gear provides automatic brake — no brake bands to adjust or replace.
- Weighing only 57 pounds, the CP AIR HOIST can readily be carried by millwright to any location.
- Furnished in 300, 500, 700, and 1000 pound capacities.

*Write for a copy of Bulletin SP-3027*

CHICAGO PNEUMATIC TOOL COMPANY
General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
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CP Fiftieth ANNIVERSARY

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**CLEAR FLOOR SPACE,** the starting point for industrial efficiency, is obtained economically with engineered and precision-built trusses of Timber Structures, Inc. These are available in spans up to 250 feet or more with arched, flat, pitched, sawtooth or monitor top roof contours. Moderately priced. Strong, permanent, low maintenance. Adaptable for mezzanines, balconies, hoist and monorail installations.

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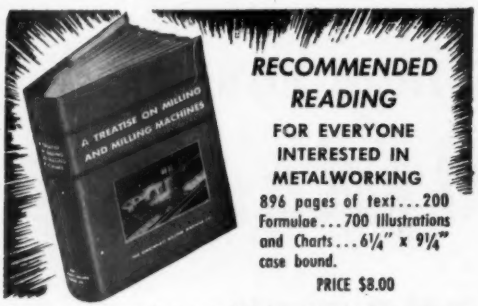
**Write for Industrial Buildings Booklet**

Here are eight pages of outstanding factory and warehouse buildings with construction details and dimensional data. A copy is yours for the asking—write for it today.




## RECOMMENDED READING

**FOR EVERYONE INTERESTED IN METALWORKING**

**896 pages of text... 200 Formulae... 700 Illustrations and Charts... 6¼" x 9¼" case bound.**

**PRICE $8.00**

Everyone interested in metal-working should have a copy because it's the most informative book ever written about milling and milling machines. Covers the entire field from elements of machine construction to the economics of replacement. Fill in the coupon and mail it today. Enclose check or purchase order. THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO.

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Please send_____copies of "A TREATISE ON MILLING AND MILLING MACHINES" at $8.00 each (postage, sales and local taxes included).

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STREET AND NO._____

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## *See You in Cleveland*

**JANUARY 19-22**
**PLANT MAINTENANCE SHOW**
**Booth 123**

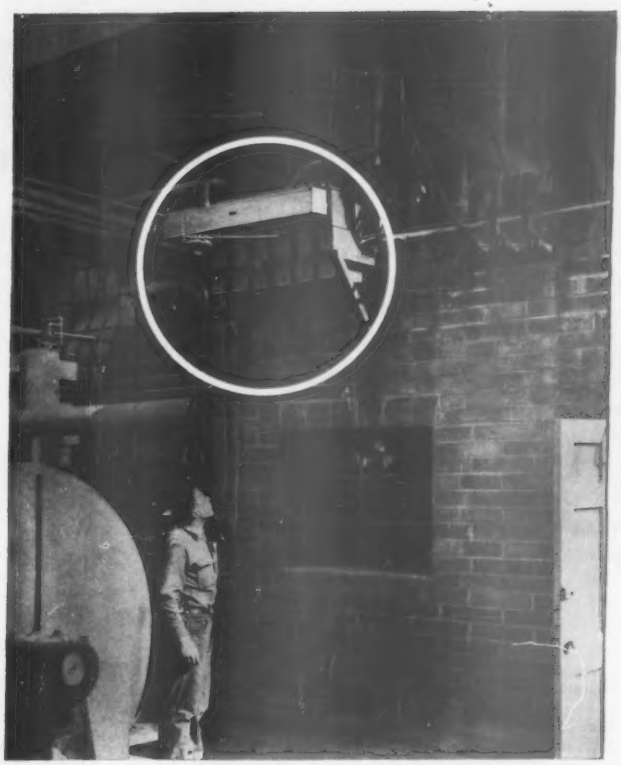
We want you to see *Albina* Swing Stages in operation. You can judge for yourself the smooth, safe operation and the savings it affords you. Units are electric and air operated and may be used as a single stirrup.

***Write for Complete Illustrated Catalog***

**ALBINA ENGINE & MACHINE WKS.**

2100 N. Albina Ave. Portland, Oregon

**Prevents transformer "burnouts."** This 90-kvar, 3-phase, 60-cycle, 460-volt G-E capacitor equipment (circled) helps relieve transformer overloading. Solomon Fingold, Montrose Chemical's electrician, surveys it appreciatively.



# Overloaded transformers relieved with G-E Capacitors

**Montrose Chemical Corp. of Calif. prevents transformer "burnouts," saves $1800 a year on power costs . . . with $1451 investment.**

Rapid postwar expansion put a heavy overload on the transformers that supply power to the Montrose Chemical Corp. of California, located in Los Angeles. Recently, when the overload became critical, the Company sought help. An investigation showed that the plant's power factor was down to 76%—so General Electric engineers recommended the installation of 180 kvar of General Electric capacitors at a cost of $1451.

**Capacitors improve power factor.** Once installed, the capacitors brought the plant's power factor up to better than 97%. This relieved transformer overloading by reducing line current. And since Montrose Chemical had a power-factor clause in its power contract, it also cut power costs by $1800 a year. Thus, the saving on power costs alone will pay for the equipment in less than ten months! *And these savings will go on indefinitely.*

**Capacitors provide other benefits, too!** Besides releasing transformer capacity, capacitors often permit your present distribution system to carry 20 to 30% more load without added equipment. Where voltage drop is a problem, capacitors can also provide the needed voltage boost inexpensively.

**They often hold key to lower power costs.** If your power factor is below 85% and if there is a power-factor or kva-demand clause in your power contract, chances are you, too, can make worthwhile savings on your power costs by installing capacitors. For additional information, consult your local G-E Apparatus Sales Office or authorized G-E agent or distributor. Or write to Section 407-210 for Booklet GEA-5632—"How to Use Capacitors to Reduce Power Costs and Gain System Capacity." General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

# Niagara's HYGROL DRIES AIR BEST

## with exact moisture content

- to control your product's quality
- to prevent condensation on your product or material
- to prevent changes due to moist air in contact with your product
- to protect your material from dampness
- to protect your processing of moisture-sensitive material
- to DRY your material or product
- to pack or store your product safe from moisture damage
- to get exact moisture control for the precise atmosphere condition you need
- to provide precise atmospheric conditions for testing
- to increase your air conditioning capacity
- to DRY large quantities of fresh air from outdoors

***The Niagara's Controlled Humidity Method using HYGROL moisture-absorbent liquid is***

**Best and most effective because . . .** it removes moisture as a separate function from cooling or heating and so gives a precise result constantly and always. Niagara machines using liquid contact means of drying air have given over 20 years of service.

**Most reliable because . . .** the absorbent is continuously reconcentrated automatically. No moisture-sensitive instruments are required to control your conditions.

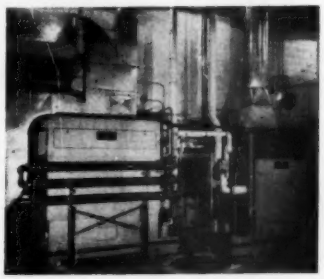
**Most flexible because . . .** you can obtain any condition at will and hold it as long as you wish in either continuous production, testing or storage.

**Easiest to take care of because . . .** the apparatus is simple, parts are accessible, controls are trustworthy.

**Most compact,** taking less space for installation.

**Inexpensive to operate because . . .** no re-heat is needed to obtain the relative humidity you wish in normal temperature ranges and frequently no refrigeration is used to remove moisture.

**The cleanest because . . .** no solids, salts or solutions of solids are used and there are no corrosive or reactive substances.



**Niagara Controlled Humidity Air Conditioning**

This method removes moisture from air by contact with a liquid in a small spray chamber. The liquid spray contact temperature and the absorbent concentration, factors that are easily and positively controlled, determine exactly the amount of moisture remaining in the leaving air. Heating or cooling is done as a separate function.

***For complete information write***

## NIAGARA BLOWER COMPANY

**Dept. F, 405 Lexington Ave., New York 17, N. Y.**

*District Engineers in Principal Cities of United States and Canada*


# Changing Address ?

- If you are planning to move, please be sure to let our Circulation Department know about it — and as far in advance as possible.
- It takes time to correct the stencil addressing plate and to make the correction on all our records. So your prompt notification will help us make sure you do not miss copies of FACTORY.
- Be sure to give us your OLD address as well as your NEW address. We need them *both* to make the correction.
- Mail in the coupon if you plan to move. And please fill it in as completely as possible.

***THANK YOU!***

**Circulation Dept.**
**FACTORY Management and Maintenance**
**330 West 42d St.**
**New York 36, N. Y.**

***Change of Address Notice***
**(PLEASE PRINT)**

On or about _____

my NEW address will be . . .

Street _____

City _____ Zone _____

State _____

*My OLD address was . . .*

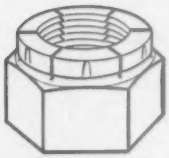
Street _____

City _____ Zone _____

State _____

_____

**Name Here**



FLEXLOC Self-Locking Nut

# "What are Flexloc locknuts?"

*"They're nuts that hold assemblies together, and they just won't work loose like ordinary nuts."*

Nuts that loosen are headaches, or even worse, because they may necessitate shutting machines down. When that happens, production flops, assembly lines stop, and delivery promises are not kept. FLEXLOC locknuts offer a simple solution to such problems—they don't work loose. And though they stay put, they can easily be removed with a wrench when necessary.

Standard FLEXLOC Self-Locking Nuts have a higher tensile value than most other locknuts. They're not affected by temperatures up to 550°F. Their torque is controlled within such narrow limits that they have been used successfully on plastic studs. FLEXLOC locknuts are stop nuts, too. They lock when you stop turning them—they don't have to be seated.

Increased capacity now enables us to make quantity shipments of FLEXLOC locknuts in a wide range of sizes. Write for literature and samples. STANDARD PRESSED STEEL CO., Jenkintown 11, Pa.

FLEXLOC LOCKNUT DIVISION

SPS

JENKINTOWN, PENNSYLVANIA

## HOW TO GET THE RIGHT PAINT FOR ONE-COAT COVERAGE

New, free book brings industrial painting facts up to date. We don't make paint. But to help you get full value from the paint you buy, we'll send you this fact-packed book on aluminum paints. Read it before you plan another paint job. It can save you time and dollars.

You may know that aluminum paint is best for many places in your plant, but do you know what *kind* of aluminum paint is best for each job? Some are specially formulated for painting metal and masonry, others for wood, others for heated surfaces. Mail the coupon for the free book that answers these and hundreds of other paint questions.

**SEND FOR FREE BOOK**

ALUMINUM COMPANY OF AMERICA,
Paint Service Bureau, 1792-M Gulf Bldg., Pittsburgh 19, Pennsylvania.

Please rush me free copy of "Painting with Aluminum."

Name (please print)_____

Address_____

City_____ State_____

We plan to paint the following_____

Look for this shield on aluminum paints made by many paint manufacturers using ALCOA PIGMENTS.

ALCOA ALUMINUM

ALBRON

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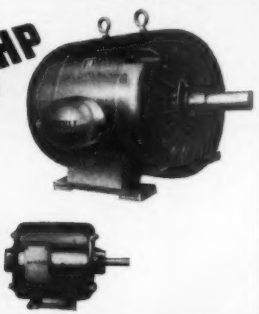
## 250 HP Down to 1/6

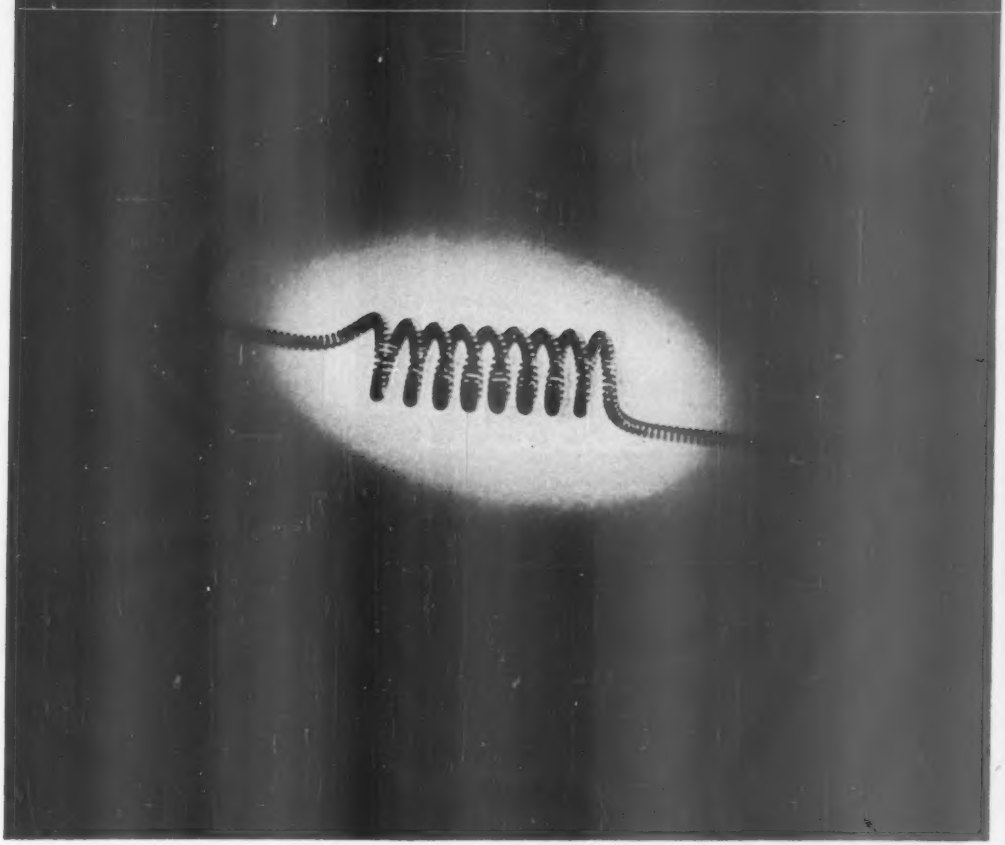


***we've got them all!***

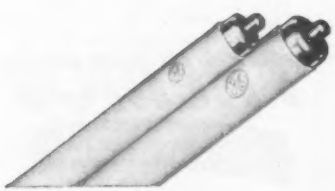
You can choose from a complete line of alternating current industrial-type motors —standard or special—single or polyphase— for every job. Get fast delivery, no red tape. Call your local Howell representative or contact us direct.

**HOWELL ELECTRIC MOTORS CO.**
HOWELL, MICHIGAN

# You expect the best value from G-E fluorescent lamps



## Extra twist squeezes more light from G-E slimline lamps



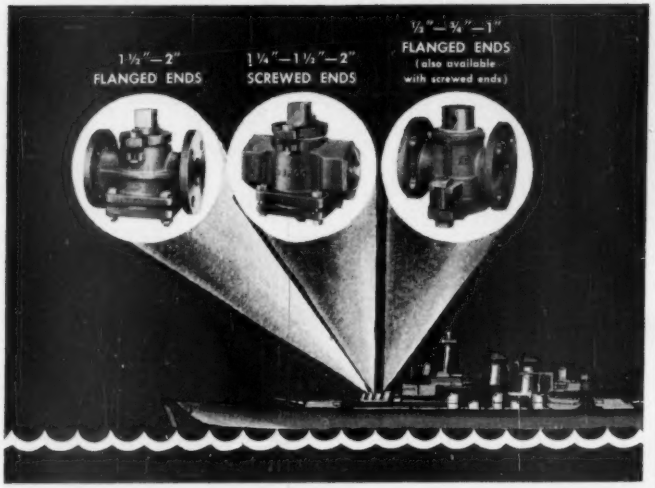
The electron flow that lights a fluorescent lamp is started by a special chemical mix held on tungsten filaments at each end of the lamp. How long the lamp lasts depends in part on how long the chemical clings to the filament. In most lamps, the filament is twisted into a double coil, to hold a quantity of the mix in a firm grip.

General Electric goes a step further by giving the double coil a third twist—making a triple coil. Used in G-E slimline and other G-E instant-start lamps, the triple coil holds more mix, and holds it more firmly. It gives you extra light for your money because it makes the lamps last longer. This is another example of why you can expect the best value from G-E fluorescent lamps.

*You can put your confidence in—*

**GENERAL ELECTRIC**

# The Chemical Industry's best defense against corrosion




## DURCO Type F Valves with Teflon®* sleeves

In the two years since DURCO Type F Valves were introduced to the chemical industry, several thousand have been put into operation, and the list of successful applications continues to grow.

DURCO engineers have designed a non-lubricated valve with no metal-to-metal contact, making use of a Teflon®* sleeve. This new design, in the correct DURCO alloy, provides you with a valve *proven* in actual service, and operating with minimum maintenance cost.

Full details are available in Bulletins V/4 and V/4a.

### 40 years' experience means—DURCO *defeats corrosion*

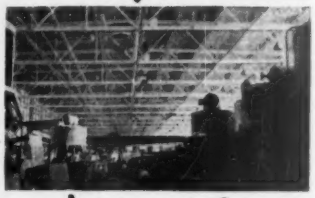
Whether you need valves or pumps to handle corrosive liquids, or piping or other corrosion resisting equipment, a nearby DURCO representative is waiting to show you the products of 40 years' experience serving the chemical industry. *Concentration* on corrosion has made DURCO the largest exclusive manufacturer of engineered corrosion resisting equipment in the world.

**THE DURIRON COMPANY, Inc., Dayton, Ohio**

DURCO
CORROSION RESISTING ALLOYS & EQUIPMENT

**Registered trademark of E. I. duPont de Nemours & Co., Inc., for its tetrafluoroethylene resin.*

# PAINTING interiors RIGHT for SIGHT



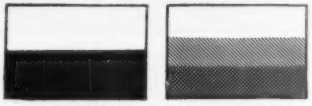
## ...at a savings

Now you can paint for better seeing—without regard to psychological color schemes. Tremco's most modern and simplified method improves seeing conditions while cutting painting costs.

**TREMCO MAN EXPERIENCE...**

enabled J. L. Lucas & Son, Fairfield, Conn., to achieve effective results at low cost. Tremco Man G. A. Stretton recommended the use of *Tremlux* 10 years ago and because it provided a smooth surface that stayed cleaner longer...it was selected again. As Tremlux can be applied by "minimum fog spray" labor was materially saved by eliminating nuisance of drop cloths and excessive clean-up time. There is a Tremco Man like him near you.

## ...with modern CONTRAST CONTROL



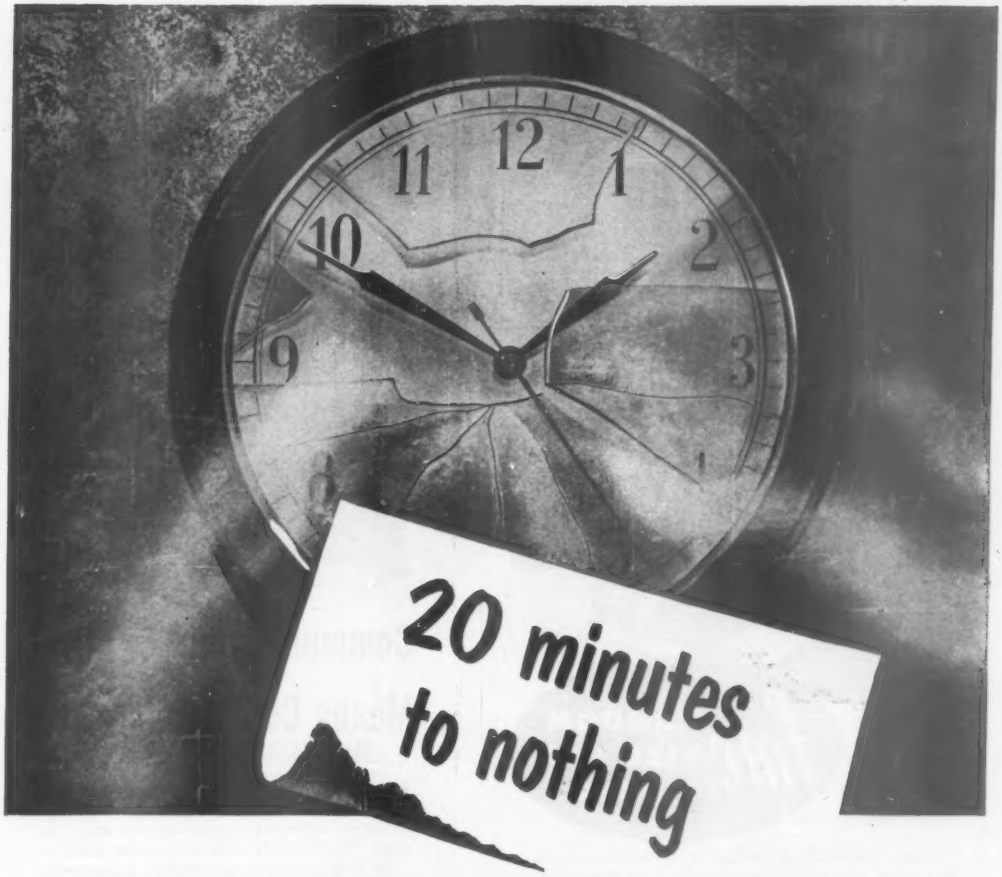
Harsh Contrast — Contrast Control

Tremco's Contrast Control interior painting system, based on close collaboration of lighting engineers and paint technicians, regulates the brightness pattern of all areas in a room. It avoids extreme contrasts regardless of color, provides comfortable seeing, eliminates eye strain and fatigue, improves efficiency and morale. For free booklet, "Your Next Paint Job" write The Tremco Manufacturing Co., Cleveland, Ohio or The Tremco Manufacturing Co., (Canada) Ltd., Toronto.

**TREMCO**

PRODUCTS AND METHODS FOR BUILDING MAINTENANCE

UM-1025




***You could know the plant . . . 20 years of steady growth . . . 20 years of work, brains and money . . . then in 20 minutes a little fire got away and reduced it all to nothing.***

But, your larger size fire hazards can be protected very efficiently at a reasonable cost, thanks to C-O-TWO Low Pressure Carbon Dioxide Type Fire Extinguishing Systems. Simple piping, running from one centrally located storage tank, instantly transports clean, non-damaging, non-conducting carbon dioxide anywhere in the plant area . . . to flammable liquids, electrical equipment, storage spaces, manufacturing processes and record vaults. Fire at any protected location is extinguished in seconds with an absolute minimum of expense and interruption.

Flexibility is the keynote with these C-O-TWO Fire Extinguishing Systems . . . the low pressure carbon dioxide storage tanks range in capacities from one to fifty tons . . . discharge facilities can either be manual mechanical, manual electric, automatic mechanical, automatic electric or a combination of these . . . especially installed to fit your particular needs. Future plant expansion is easily and economically provided for by initially installing an oversized low pressure carbon dioxide storage tank and adding the supplementary discharge facilities at a later date.

Whether it's fire detecting or fire extinguishing . . . portables or built-in systems . . . C-O-TWO means experienced engineering that assures you of the best type equipment for the particular fire hazard concerned.

**WHEN BUSINESS STOPS . . . INCOME STOPS!**

Don't take chances with your investment. Secure the benefits of highly efficient fire protection engineering today . . . our extensive experience over the years is at your disposal without obligation. Get the facts now!

C-O-TWO

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers
Dry Chemical Type Fire Extinguishers
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-In Smoke and Heat Fire Detecting Systems

**C-O-TWO FIRE EQUIPMENT COMPANY**

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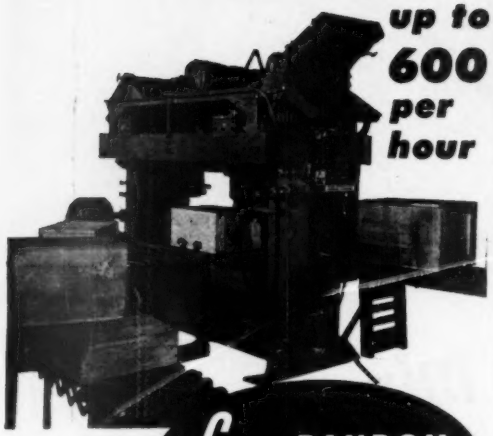
C-O-TWO FIRE EQUIPMENT OF CANADA, LTD. • TORONTO 8 • ONTARIO

*Sales and Service in the Principal Cities of United States and Canada*

AFFILIATED WITH PYRENE MANUFACTURING COMPANY

*Automatically*

# LIDS MIXED SIZE BOXES



**up to 600 per hour**

**fmc RANDOM SIZE BOX LIDDER**

The *fmc* Random Size Box Lidder meets the demand for a nailing machine which lids boxes of mixed sizes fed from a common conveyor. One operator can lid up to 600 boxes per hour on this fast and versatile machine. As boxes of mixed sizes are fed into the machine it automatically adjusts to the proper size, drives the required number of nails and discharges the lidded box on an outgoing conveyor, taking the place of several nailing machines which would otherwise be required to handle the same volume and variety of production.

**FOOD MACHINERY AND CHEMICAL CORPORATION**

*Packing Equipment Division*
*Riverside, Calif.*

fmc

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FOOD MACHINERY AND CHEMICAL CORPORATION
RIVERSIDE, CALIFORNIA

*Send Illustrated Bulletin on Random Size Box Lidder*

NAME _____

STREET AND NO. _____

CITY _____ STATE _____

NM-20-A

# Communication Means Control

VOICE COMMUNICATION is the only way to control the employees in your plant. Whistles, bells, sirens and other coded signal systems are inadequate. They do little more than attract attention.

An Altec sound system installed in your plant will give you reliable voice communication with every employee, wherever he is, whatever he is doing. Hundreds of man hours can be saved through the use of an Altec sound system for the dissemination of information and orders. Accidents and equipment breakage can be reduced through the judicial use of music broadcast during the hours of the day when fatigue and boredom are high. In an emergency, orders controlling the movements of personnel and rescue workers can save lives, equipment and finished stocks.

Whatever its size, your factory will be safer and more efficient once you have reliable voice communication with an Altec sound system. Investigate its many valuable features soon.

**ALTEC Sound Systems are an intelligent business investment**

Call your Altec dealer or write...

**ALTEC**
*LANSING CORPORATION*

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Beverly Hills, Calif.

161 Sixth Avenue
New York 13, New York

# Six strong arms and "true"

Six powerful arms of steel grip and turn the crankshaft—send power from pulsing pistons surging through the mighty Ford truck. These connecting rods are machined to tolerances of 3/10,000 of an inch—diamond-bored for precision—dynamically balanced to 1/10th of an ounce for peak performance. That's precision production—and for such exacting work in great volume, Ford Motor Company depends on Lycoming.

Lycoming stands ready to assist you—whether you have "just an idea" that needs developing, a problem in the blueprint stage, or a finished metal product that needs speedy fabrication. Long famous in the metal-working field, Lycoming continues to meet the most exacting and diverse requirements, both industrial and military. *Whatever* your problem—look to Lycoming!

**Lycoming's 2½ million feet of floor space,** its more than 6,000 machine tools, and its wealth of creative engineering ability stand ready to serve your needs.

**For precision "arms" —connecting rods that perfectly pass power along to a truck's wheels— Ford Motor Company depends on Lycoming precision production.**

*AIR-COOLED ENGINES FOR AIRCRAFT AND INDUSTRIAL USES • PRECISION-AND-VOLUME MACHINE PARTS • GRAY-IRON CASTINGS • STEEL-PLATE FABRICATION*

LOOK TO **LYCOMING** FOR RESEARCH FOR PRECISION PRODUCTION

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Please send me further information on Lycoming's varied abilities and facilities.

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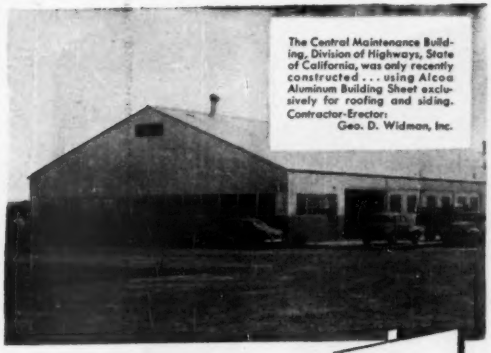

The Central Maintenance Building, Division of Highways, State of California, was only recently constructed . . . using Alcoa Aluminum Building Sheet exclusively for roofing and siding.
Contractor-Erector:
Geo. D. Widman, Inc.

## THE STATE ARCHITECTS SPECIFIED ALCOA BUILDING SHEET

DIVISION OF HIGHWAYS STATE OF CALIFORNIA

Big, tough, easy-to-handle units of Alcoa Industrial Building Sheet helped speed the construction of this highway maintenance building. With the installation of the last fastener, the job was complete . . . ready for occupancy. Typical of the low-cost, low-upkeep buildings made possible by aluminum.

Light weight Alcoa Industrial Building Sheet (only 56 pounds per square) reduces dead load. Goes up faster, requires no finishing . . . no painting.

Compare the advantages offered by aluminum with those of any other material. Next time *you* figure a building job, figure it in aluminum . . . Alcoa Aluminum Building Sheet.

### FACTS FOR ENGINEERS

Alcoa Industrial Building Sheet may be erected over steel or wood; and there is a fastener for every type of job.

**Lengths:** 5 to 12 feet.

**Widths:** Roofing, 35 inches—Siding, 33¾ inches (32-inch coverage).

**Thickness:** .032 inches—equal to 22 U. S. Gauge.

For complete engineering and application details, write for booklet AD-167.

ALUMINUM COMPANY OF AMERICA
804-M Gulf Building • Pittsburgh 19, Pa.

ALCOA
INDUSTRIAL BUILDING SHEET

## want to show your management some BIG SAVINGS? Install Hapman TUBULAR CONVEYORS

**FOR METAL CHIP AND DUST REMOVAL ON 3 TYPES OF INSTALLATIONS:**

### DEPARTMENT OR PLANT-WIDE CHIP-CONVEYING SYSTEMS... 1.

Here's the latest of many complete Hapman chip-handling systems installed in major automotive plants. In all cases, they've *proved their ability* to pay big dividends fast.

### AS ORIGINAL COMPONENTS ON NEW MACHINES AND EQUIPMENT... 2.

You can get low-cost, *automatic chip, dust or sludge removal* on new machines of many types by *specifying Hapman Conveyors* as original equipment. We cooperate with the tool builder.

### ADDED TO EXISTING MACHINES OF MANY TYPES... 3.

You can also show your Management important, quick-return savings by installing Hapman Conveyors on existing equipment such as these profile milling machines — or on broaching machines, grinders, drills, quench tanks, etc. You can *prove* the savings—

**INVESTIGATE NOW**— WRITE FOR BULLETIN FM-1252

Hapman CONVEYORS, INC.
DIVISION HAPMAN-DUTTON COMPANY
KALAMAZOO MICHIGAN

# "LONG LIFE OF G-E IGNITRONS SAVES US HUNDREDS OF DOLLARS A SOCKET!"

*Says*

**Arnold F. Weil,** Chief Plant Engineer,
Solar-Sturges Mfg. Div.
of Pressed Steel Car Co., Inc.,
Melrose Park, Illinois.

"In several cases, our G-E ignitrons have been in operation more than three years. They've piled up work hours to twice or three times normal life. They have saved us many costly tube replacements, since we employ ignitrons extensively for welding, which is one of our main processes. Also, Solar-Sturges uses power tubes for induction annealing, and thyratrons and receiving tubes for control circuits. All these G-E types are dependable. They help us to keep machine outages at a minimum—another important factor in holding down our costs.

"General Electric tube service is prompt, and tube-maintenance counsel is available whenever we request it. We're more than satisfied!"

**Electronic seam-welding** seals the milk cans, waste receptacles, and metal cooking ware produced at Solar-Sturges—one of Pressed Steel Car Company's many factories for products ranging from auto bumper guards to complete railroad cars. G-E tube reliability helps to keep welder output high . . . maintenance needs and costs low.

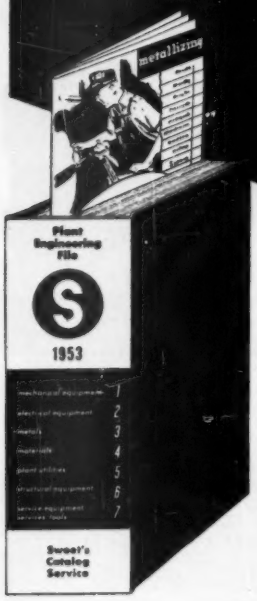
● Get from your G-E tube distributor the benefits of (1) a long-lived, more dependable tube product, (2) fast deliveries out of local stocks, (3) tube-conservation help that will mean dollars saved through operating economies! Phone your distributor today! *Tube Department, General Electric Co., Schenectady 5, N. Y.*

*You can put your confidence in—*

**GENERAL ELECTRIC**

161-165

# to help you find out fast...




## how some 6,000 users of metallizing save time and money

- *in the repair of worn or damaged machine parts*
- *in the salvage of parts mis-machined in production*
- *in production applications*
- *in long term corrosion protection of equipment and structures . . .*

Section 7 a/Me of your new Sweet's PLANT ENGINEERING FILE contains the most comprehensive story of metallizing and its practical applications we've ever been able to put together. When plant engineering men want information, they usually want it fast; and these eight pages tell what metallizing is, how it works, its advantages and limitations, describe the latest developments in metallizing techniques, illustrate a wide range of jobs being done by metallizing users, with case histories, complete with figures on savings in time and money.

Now, it's easy to take the first step in finding out if metallizing can save time and money for your plant. Just check your new Sweet's PLANT ENGINEERING FILE, Section 7 a/Me, and see.

**METALLIZING ENGINEERING CO., INC.**
38-14 30th Street • LONG ISLAND CITY 1, N. Y.
In Great Britain: METALLIZING EQUIPMENT COMPANY, LTD. Chobham near Woking, England

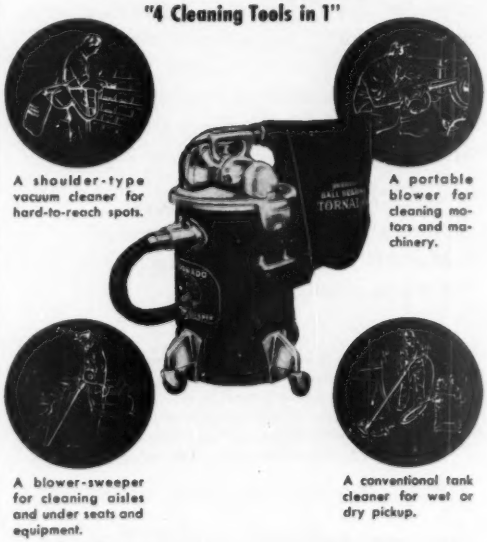
## ANTIQUE CLEANING cuts into YOUR PROFITS

Your *production methods* may be at the peak of efficiency . . . but how about your *cleaning methods?* Out of date floor cleaning equipment can affect your profit picture just as much as labor, material and taxes.

Tornado cleaning equipment is engineered to fulfill the needs of modern commercial and industrial cleaning. Just think of a vacuum cleaner that pulls air at velocities over 300 M.P.H.—picks up water, oil, scrubbing solutions, metal chips or dirt in a single stroke—plus an adaptability to clean machinery and overhead fixtures as well as all type floors.

Protect your profits with America's most modern floor cleaning equipment—Write for Tornado Bulletin 607 today.

### THE FAMOUS TORNADO 92
"4 Cleaning Tools in 1"



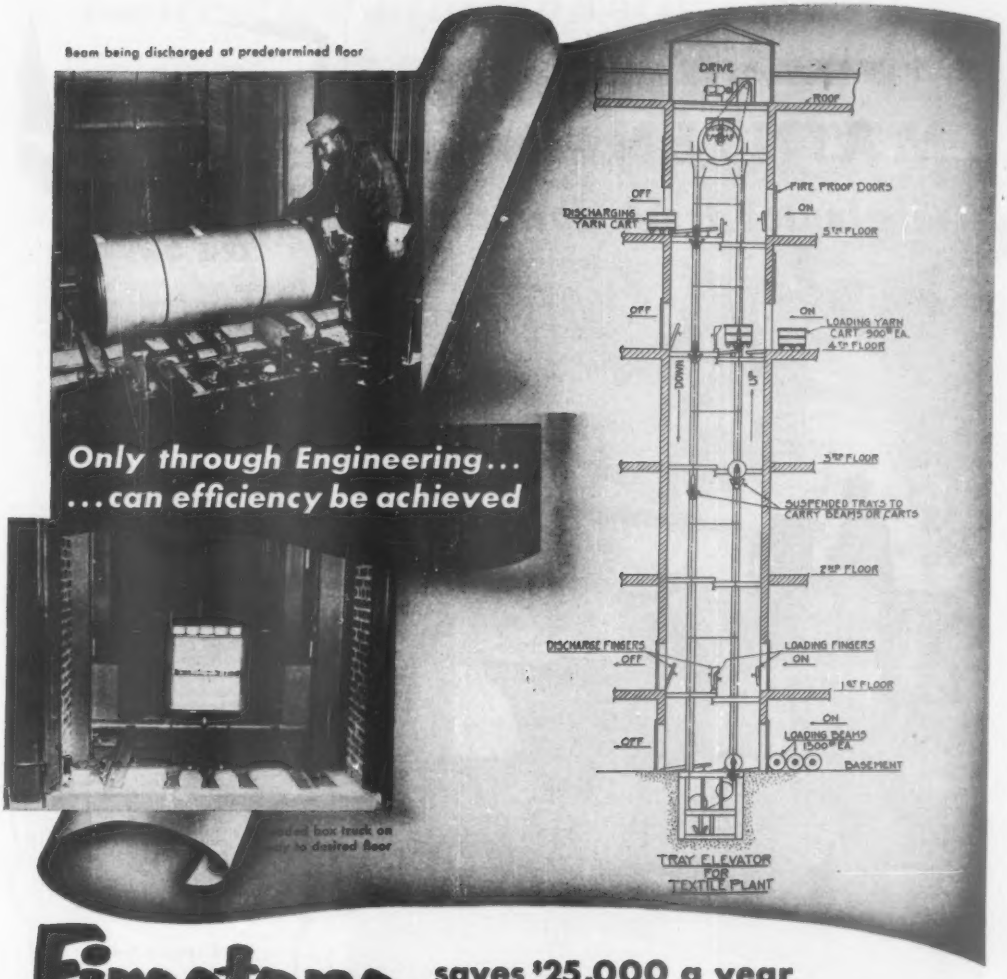
A shoulder-type vacuum cleaner for hard-to-reach spots.

A portable blower for cleaning motors and machinery.

A blower-sweeper for cleaning aisles and under seats and equipment.

A conventional tank cleaner for wet or dry pickup.

**BREUER ELECTRIC MFG. CO.**
5084 NORTH RAVENSWOOD AVENUE • CHICAGO 40, ILLINOIS




# Firestone saves $25,000 a year with this G-W "Ferris Wheel"

Moving 1300-lb. beams of rayon and 900-lb. box trucks in and out of freight elevators is a back-breaking job. Yet approximately 230 of these bulky loads must be lifted (and empties returned) every day at the Firestone Textiles Division of the Firestone Tire and Rubber Co., Gastonia, N. C.

This Gifford-Wood "Ferris Wheel"—a 6-story roundabout tray elevator—has assumed most of the work load. Beams and trucks are automatically picked up on the loading side of a shaftway by trays suspended between two endless chains, carried to the top, eased over the drive sprockets, lowered to the desired floor, and automatically discharged.

The $25,000 annual saving is basically one of reduced labor requirements and improved handling efficiency, and the limited manual work remaining is much less strenuous than formerly.

This is just one of many conveyors born of G-W ingenuity and experience—a product of efficiency through engineering. Call on G-W Materials-Handling Engineers to survey your present methods; you are under no obligation. It might well prove to be a step toward higher profits through lower operating and maintenance costs.

When You Think of Materials Handling—Think of **GIFFORD-WOOD CO.**

Since 1814 • Hudson, New York

NEW YORK 17, N. Y. 420 LEXINGTON AVE. | ST. LOUIS 1, MO. RAILWAY EXCHANGE BLDG. | CHICAGO 6, ILL. 565 W. WASHINGTON ST.

GD 8405

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## *eliminates truck downtime*

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Tie up a truck because of power failure? Never! Equip your fleet with *interchangeable* Ready-Power gas-electric units and, then, have one extra for the shop. Thus, power units can be rotated for preventive maintenance . . . and your trucks stay *on the job* . . . where they belong.

***Remember...Your Truck Is No Better Than Its Power!***

**The READY-POWER Co.**

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*Manufacturers of Gas and Diesel Engine-Driven Generators and Air Conditioning Units; Gas and Diesel-Electric Power Units for Industrial Trucks*

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Trying to row with one oar is like trying to operate inside and outside telephone traffic with a single system. It requires two — your regular city 'phones for incoming and outgoing calls, and SELECT-O-PHONE for all *inside* communications! SELECT-O-PHONE operates independently of your switchboard, requires no operator! And it permits you to talk with from one to 55 inside stations, individually or collectively!

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THE *INSIDE* VOICE OF BUSINESS

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any lift trucks until you check your needs against Revolvator's new Truck Index.

Send coupon today.

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Gentlemen:
We want to know, without obligation, all about Revolvator Red Giant Liftrucks.

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# *controlled atmosphere* GAS FIRED FURNACES *make* glass-to-metal bond

## *at* A. O. SMITH CORPORATION
**KANKAKEE, ILLINOIS**

Diagram of Gas-fired glass-coating furnaces at A. O. Smith Corporation, used to fire glass-lined water heaters and Harvestore sheets. Capacity of one furnace is 1,182 cu. ft. At left: Load enters furnace.

Gas-Firing for dependable glass-to-metal bonding is accomplished under controlled atmosphere conditions at A. O. Smith Corporation's plant in Kankakee, Illinois. Three furnaces like the one shown are utilized. Each furnace has two zones. First zone, at 1050° F. is for pre-heat, controlled oxidation, and the second controlled atmosphere zone fires at 1600° F. Each zone is fired by 16 Gas burners, eight to a side through heat resistant alloy "radiant" tubes. All Gas-firing is under precise automatic control, to get exact temperatures needed for processing.

Process Heating with GAS is used at A. O. Smith in a variety of ways, too.

1. **Gas-fired immersion coils in liquid baths**
2. **Submerged Gas burners in pickle liquor tanks**
3. **Direct Gas-fired burners for heating zinc, hot-dipped, galvanized**

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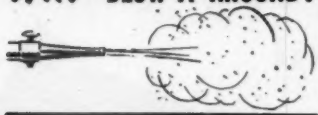

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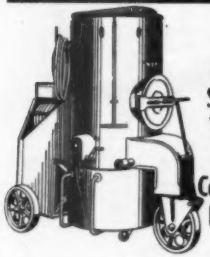

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Hoffman equipment saves on plant maintenance, spurs production by removing dust and dirt in one operation . . . no re-handling! Fast, flexible cleaning that goes anywhere—floors, walls, overhead areas, in and around equipment (also while plant is operating). Recovers valuable material—removes fire and explosion dust hazards—boosts employee morale.

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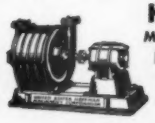

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**Directs Light Exactly as Needed as Easily as Pointing your Finger**

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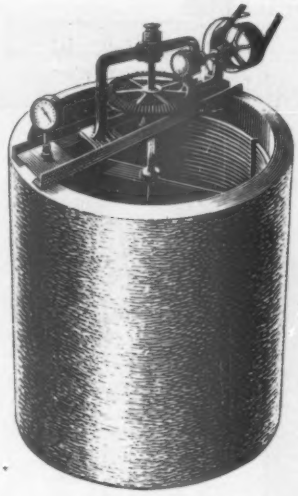

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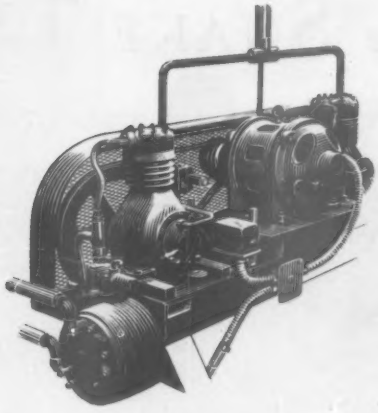

THIS 5-H.P. "FREON" REFRIGERATING MACHINE

# SAVES manufacturer 480 hours

*CAN MODERN REFRIGERATION HELP YOU, TOO?*

Industries of all kinds today are using refrigeration and air conditioning in many different ways...often with spectacular results. For example: A large manufacturer of soap required three weeks to produce a clear liquid product. Engineers studied the production problem . . . solved it by designing a method of cooling soap ingredients. Now the operation takes only 24 hours . . . saving 20 days! In addition, curing and storing tanks that were no longer needed in the plant made valuable space available for other purposes.

Scores of manufacturers are now putting refrigeration and air conditioning to work in their plants. They're stepping up production . . . lowering costs . . . improving product quality . . . promoting employee comfort and efficiency . . . increasing profits.

Perhaps you could do the same. Why not talk it over with others in your plant or office? Installation of an air conditioning or refrigeration system might well increase your profits substantially and bring you many other benefits.

And when the details of a system are reviewed . . . bear in mind that most modern installations are operated with "Freon" refrigerants. These refrigerants are safe . . . noncombustible, nonexplosive, virtually nontoxic, and their amazing purity insures dependable, economical performance of the equipment over a long period of time. A new book, "How Air Conditioning and Refrigeration Benefit Industry," will be sent upon your request. E. I. du Pont de Nemours & Co. (Inc.), "Kinetic" Chemicals Division, 7524C Nemours Building, Wilmington 98, Delaware.

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. . . THROUGH CHEMISTRY

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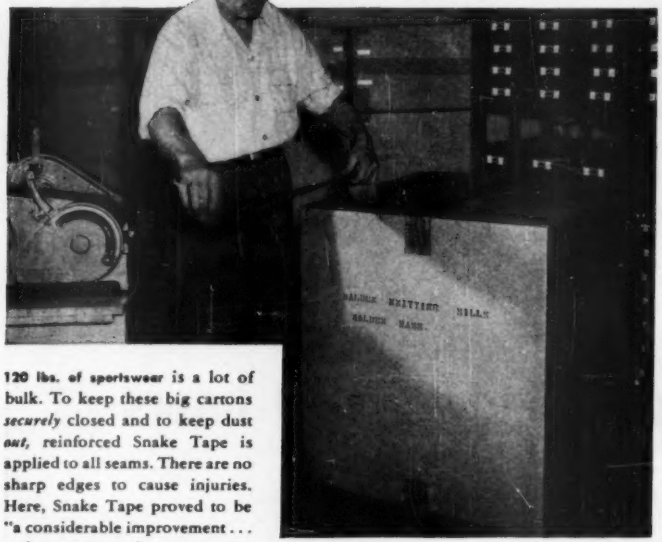
# *the* SNAKE TAPE *way*

## *saves time, seals cartons stronger*



**120 lbs. of sportswear** is a lot of bulk. To keep these big cartons *securely* closed and to keep dust *out,* reinforced Snake Tape is applied to all seams. There are no sharp edges to cause injuries. Here, Snake Tape proved to be "a considerable improvement . . . and we estimate that we save 10-15% in packaging time."

**Center-seam sealing** with Snake Tape "saves about half the time required by the previous method." It makes a neater package. Its strap-like strength eliminates damage due to tape failure. Isn't center-seam sealing with Snake Tape an idea for you?

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- Reinforced!
- Six widths!
- Easily dispensed by "cut-off" type machines!

**Accepted** for parcel post, railway express, air express, and truck shipments, center-seam sealing with Snake Tape is also accepted for carload and LCL rail shipments where rule 5, section 1 (c) of Uniform Classification applies.

**FREE** test sample!

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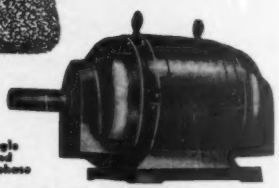

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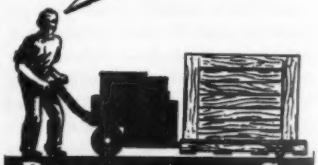
**FREE!**

Revolvator's new Truck Index helps you pick size, capacity and type to suit your needs. Send coupon today.



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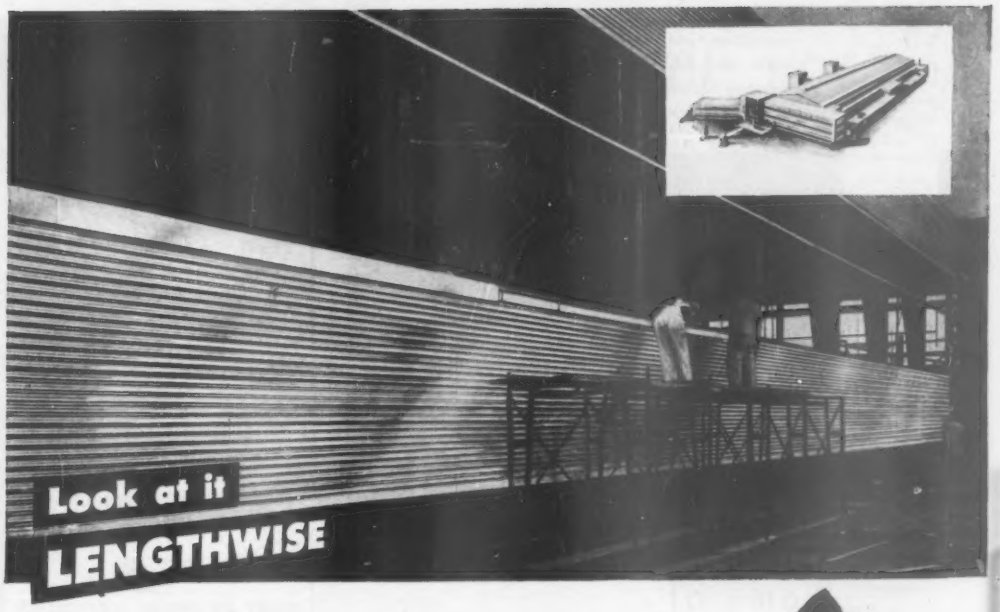


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Both as siding and as roofing (vertically applied) this material saves substantially on labor costs. It is light weight, easy to handle... workmen like it. In addition, aluminum reflects radiant heat ...keeps interiors up to 15° cooler in summer and warmer in winter.

Plan your next construction with this high-strength aluminum that never rusts, resists corrosion.

**Call Reynolds for literature and technical assistance...offices in principal cities. Check your classified phone book for our listing under "Building Materials," or write to Reynolds Metals Company, Building Products Division, 2007 South Ninth Street, Louisville 1, Kentucky.**

**Specifications:**

Thickness .032"
Weight 56 lbs. per square
Corrugations 7/8" deep, 2-2/3" crown to crown
Roofing width 35", coverage 32"
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**Military demands for aluminum limit supply, but Reynolds is rapidly expanding aluminum capacity. Rated orders receive priority handling.**

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# ALVEY-FERGUSON

*the original-Since 1901*

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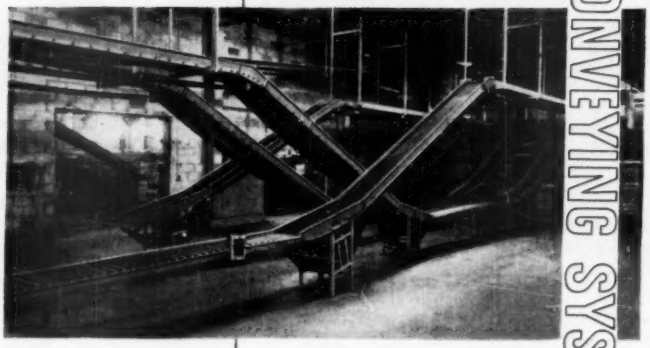

IF YOU could see this A-F Engineered Completely Co-ordinated Conveying System — from its beginning at the receiving docks to its end at storage and shipping, you would appreciate the superiority of A-F Conveyor Engineering service.

A-F For a discussion of latest efficient handling methods write today.

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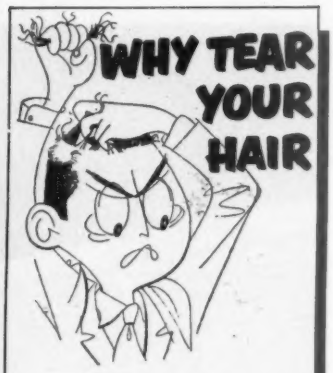


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**for automotive transmission builder**

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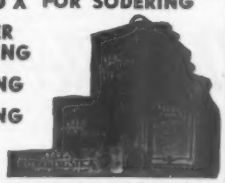

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MISCELLANEOUS EQUIPMENT

*Begins on page 198*

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Readings are presented in numerical form, tabulated for convenient use on a single page for easy handling and filing. Shows voltage, current, power, temperature, and flow.

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*(Continued on page 364)*

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P-5917, FACTORY MANAGEMENT & MAINTENANCE
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*(Continued from preceding page)*

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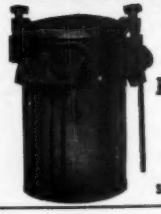

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# These "Firsts" Helped Westinghouse Customers

## USERS OF WESTINGHOUSE TUBES GET FIRST BENEFITS FROM MANY NEW TUBE DEVELOPMENTS

These are only a few of the "firsts" that Westinghouse created in the electronic tube industry. In each case, designers using Westinghouse Tubes gained advantages by having first chance to use these innovations.

Today, Westinghouse still pioneers in electronic tubes and tube making. For instance, Westinghouse 40 KV and 20 KV rectifying tubes are under 9 ounces, only 2¾" high. Designers seeking the ultimate in space and weight savings will find them in these new WL-6102 and WL-6103 tubes.

Radical new developments in other power tubes and receiving and television picture tubes are now being engineered at the *NEW* Westinghouse Electronic Tube Division at Elmira and Bath, New York.

### NEW SERVICE, NEW DISTRIBUTION

Westinghouse plans for Electronic Tube Division expansion are in operation. New service facilities, new warehousing policies, and new distributors are opening rapidly.

New merchandising methods will aid distributors in serving industrial users—many of these business-building programs are totally new in the tube industry. Here, as elsewhere, Westinghouse plans to provide industry leadership in service.

*It pays in profits to deal with Westinghouse and with Westinghouse distributors. For full information on how Westinghouse can help you with problems of design, service, or supply, call your nearest Westinghouse representative, or write to Department F-112*

**RELIATRON™ TUBES**

YOU CAN BE SURE... IF IT'S Westinghouse

ET-95003

ELECTRONIC TUBE DIVISION

Westinghouse Electric Corporation
Box 284, Elmira, N. Y.

*Any way you look at it...*

# SQUARE D's balanced design means a better Motor Starter

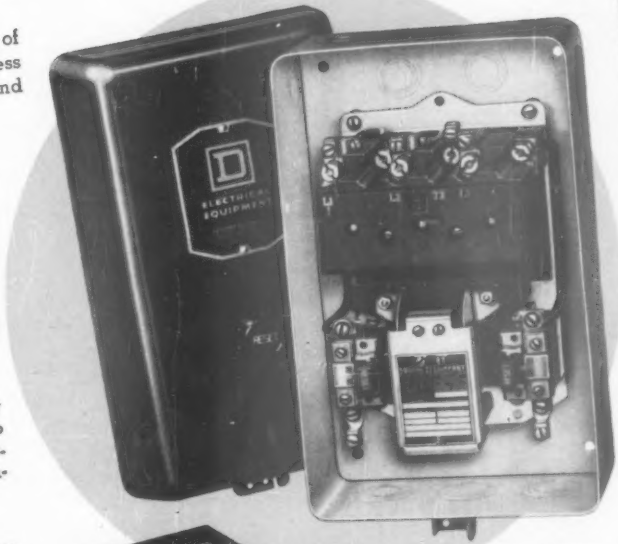
Designed to provide the highest degree of accessibility, flexibility, and compactness —with no sacrifice of performance and long life.

**EASY WIRING...**
Plenty of wiring space and easy-to-get-at solderless terminals. Installation is a breeze.

**ACCESSIBILITY...**
Coils, contacts or overload relays can be changed without disturbing external connections. A screwdriver is the only tool you need.

**FLEXIBILITY...**
Three extra electrical interlocks may be added to size 1 starters; four to sizes 2 and 3. Contacts may be normally open, normally closed, or double circuit.

**PERFORMANCE...**
Straight line, guided motion minimizes wear. Large silver alloy contacts insure exceptionally long life and trouble-free performance.

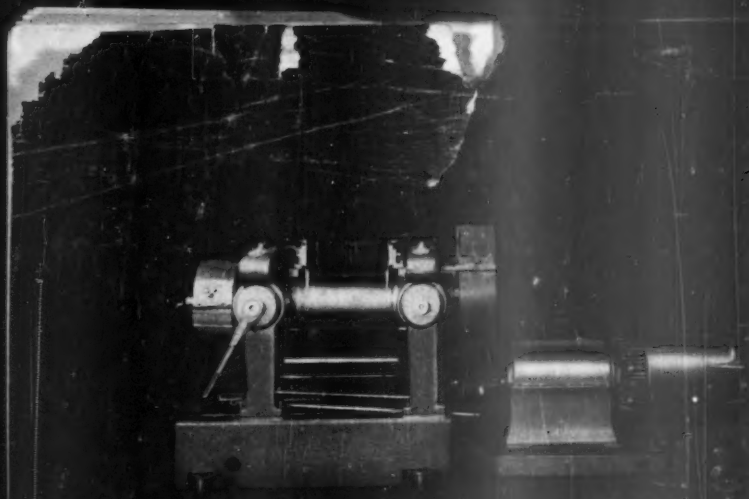


**"Off-the-Shelf" Parts Kits** make normal maintenance easier than ever. Each kit contains parts necessary to replace all load contacts and finger springs. Electrical interlocks also available in kit form.

*Write* for Bulletin 8536
Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY



When you use a power drive which is an assembly of motors, pulleys and belts, chains and sprockets, gearing, speed reducers, etc., you waste time and money in purchasing, handling and assembling these various units into the final drive.

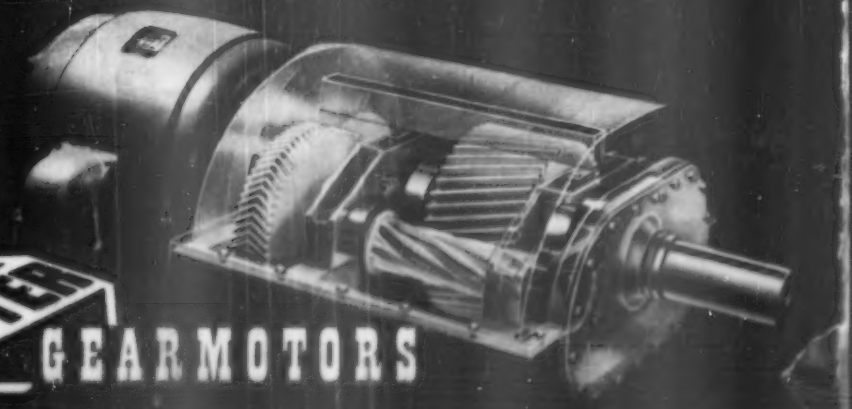
Master power drives designed as complete units with component parts matching size for size and rating for rating offer you considerable saving in space and money . . . especially in the larger sized units.

So don't put up with "make-shift" assemblies when you can select from Master's broad line, standard units which easily combine to give you the RIGHT horsepower, the RIGHT shaft speed, the RIGHT features in one compact unit that you can use RIGHT where you want it.

Use the RIGHT power drive to increase the saleability of your motor driven products . . . improve the economy, safety, and productivity of your plant equipment. That's the horsesense way to use horsepower.

**THE MASTER ELECTRIC COMPANY • DAYTON 1, OHIO**

# BIG ones too



MASTER

# GEARMOTORS

1/8 TO 125 HORSEPOWER